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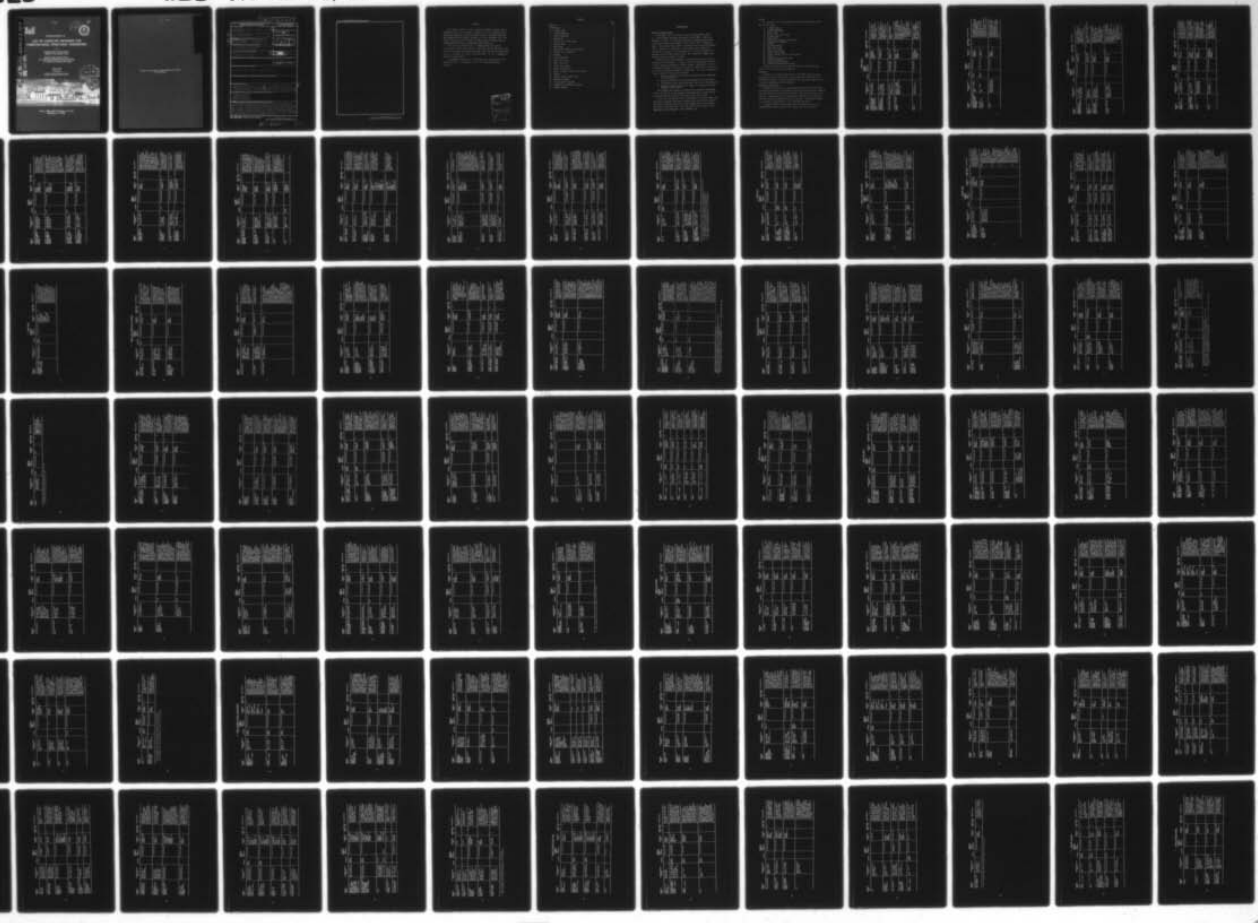

TECHNICAL REPORT K-78-1

LIST OF COMPUTER PROGRAMS FOR COMPUTER-AIDED STRUCTURAL ENGINEERING

by

N. Radhakrishnan, Deborah Kaufman
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Automatic Data Processing Center
U. S. Army Engineer Waterways Experiment Station
P. O. Box 631, Vicksburg, Miss. 39180

February 1978
Final Report

Prepared for Office, Chief of Engineers, U. S. Army
Washington, D. C. 20314

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Updated and rearranged by structure types from Corps-Wide Conference on Computer-Aided Design in Structural Engineering: Volume II, List of Computer Programs for CADSE by Dr. N. Radhakrishnan and Dorothy B. May; August 1976.

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Hydraulic structures
Structural engineering

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report contains a list of structural engineering and structures-related computer programs that are available with the U. S. Army Corps of Engineers. The list is arranged by structure-types and contains the computer program name, the author/contact person and office, library (if applicable), program number, computer and mode, information as to whether the program is documented or not, and a short description of the main objective of the program. Twenty-two structure groupings are provided and programs that fall in more than one subject category have been listed in all appropriate categories.

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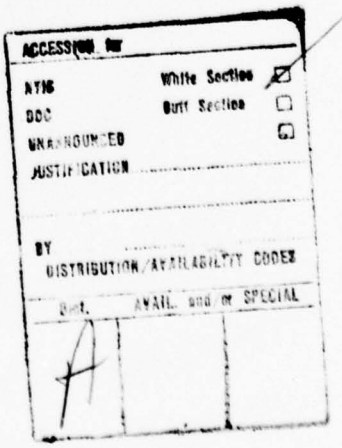
PREFACE

This report contains a list of computer programs, updated and expanded from the list contained in Volume II of the Proceedings of the Corps-Wide Conference on Computer-Aided Design in Structural Engineering conducted in New Orleans, Louisiana, on 22-26 September 1975. The report was prepared for OCE under the WES project to support the OCE Computer-Aided Structural Engineering (CASE) Committee.

The list was compiled by Dr. N. Radhakrishnan, assisted by Mr. William A. Price, Miss Deborah A. Kaufmann, and Mrs. Dorothy B. May, all of the Computer Analysis Branch (CAB), under the general supervision of Mr. J. B. Cheek, Jr., Chief, CAB, ADP Center. Mr. D. L. Neumann was Chief of the ADP Center.

The Commander and Director of WES during the preparation of this report was COL J. L. Cannon, CE. Mr. F. R. Brown was Technical Director.



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INTRODUCTION

History of Program List

In December 1974, the Automatic Data Processing (ADP) Center, U. S. Army Engineer Waterways Experiment Station (WES), submitted a proposal to conduct a Corps-wide Conference on Computer-Aided Design in Structural Engineering (CADSE) to the Office, Chief of Engineers (OCE). OCE approved the proposal, and efforts were started in February 1975 to conduct this Conference. The Conference was conducted in New Orleans, Louisiana, 22-26 September 1975, and was attended by 175 engineers from 48 Corps field offices, OCE, Construction Engineering Research Laboratory (CERL), and WES.

Twelve reports were published in August 1976 that cover the Proceedings of the Conference. Volume II of the Proceedings was entitled "List of Computer Programs for CADSE" and was a compilation of a list of computer programs, available in the various Corps offices, that would be of use to structural engineers in the Corps. The list was compiled using a number of sources that included:

a. The State-of-the-Corps-Art papers presented by the moderators in the Conference.

b. Papers presented by the Division speakers in the Conference.

c. Discussions at the various specialty sessions of the Conference.

d. Personal communications with a number of structural and ADP engineers in the Corps.

The programs were grouped according to the program's originating office, so that all of the programs originating from or being used by a particular office would be listed under that office's name.

After this list had been used a few months, it became evident that some useful programs had become available since the list was compiled and that it would be more useful if the program names were arranged according to structure type. This new report is the product of the updating and re-arrangement of the original list.

Content

The programs have been grouped under the following subject groupings in this report:

1. U FRAME Locks
2. U FRAME Channels
3. Gravity Monoliths
4. Miter Gates
5. Sector, Lift, Other Gates
6. Tainter Gates
7. Trash Racks
8. Single Cell Conduits and Culverts
9. Multiple Cell Conduits
10. Tunnels
11. Pile Foundations
12. Sheet Pile Cells
13. Sheet Pile Walls
14. L-Walls and T-Walls
15. Frames and Trusses
16. Beams, Columns, Plates, Beam-Columns
17. Bridges
18. General Purpose Design Aids
19. Geometry Programs
20. Finite Element Programs
21. Earthquake and Dynamic Analysis

Programs that fall in more than one subject category have been listed in all the appropriate categories.

Footnotes

Footnotes are grouped separately for each subject group and are placed at the end of that group. Some programs are identified in the DESCRIPTION COLUMN as being recommended by the Corps-wide Computer-Aided Structural Engineering (CASE) Committee.

Additional Information

Programs that are part of the Conversationally Oriented Real-Time Program System (CORPS), the Waterways Experiment Station Library (WESLIB), and the Engineering Computer Program Library (ECPL) are so noted in the listings. Documentation for the programs in the ECPL can be obtained from the Technical Information Center at the WES. The telephone number of the library is 601/636-3111, Ext. 2581 (FTS 542-2581).

Program information is available from the people listed in the AUTHOR/CONTACT OFFICE column of the program list in this report.

1. U FRAME LOCKS

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
STRUCTURAL ANALYSIS OF CONCRETE U-FRAME LOCK ON PILES (2-D Flex-PILE)	Edward Demsky St. Louis Dist.		713-F3-A3-910	HONEYWELL G-600/6000 FORTRAN TSS	X		Program performs an analysis of a two-dimension concrete U-frame lock on piles driven in sand.
SYMMETRICAL U-STRUCTURE ON AN ELASTIC FOUNDATION	W. M. Rankin R. L. Renner Leonard Gloeb St. Paul Dist.		713-G1-F5-050	G-225 BATCH FORTRAN II	X		The program will analyze a symmetrical U-shaped structure loaded symmetrically and supported on an elastic foundation.
LOCK CULVERT WALLS	W. R. Noulett-Ardine Pittsburgh Dist.		713-F7-H4-040 (713-24-040)	G-225 BATCH FORTRAN		X	Computes moments & forces for steel design.
U-FRAME STRUCTURE DESIGN	James B. Gaines Malcom J. Babb Virginia Williams Mobile Dist.		713-S8-K5-180	UNIVAC 1108 BATCH FORTRAN IV	X		Provides a preliminary design of a reinforced concrete stilling basin or other concrete U-frame structure. Computes and prints out- 1) Member sizes 2) Forces & moments on members 3) Areas & perimeter of reinforcing steel required at various locations.
EPVKS1	Tom Jeffus Fort Worth Dist.		713-G9-M2-064	HONEYWELL G-400 BATCH G-635 TSS FORTRAN		X	Design of U-frame structure computes wall and slab moments and shears. Base pressure can be varied.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
A COMPUTER PROGRAM FOR LOCK CULVERT FRAME ANALYSIS (CULVERT)	Paul K. Senter Fred T. Tracy WES	WESLIB ECPL	713-F3-R0-017	G-635 TSS BATCH FORTRAN	X		This program was developed to calculate the shears and moments frame encompassing the side culvert in a lock wall. Some of the features of the program are: (1) the lock culvert is composed of four members, (2) the frame is subjected to four types.
GCULVERT (Culvert with Graphics)	R. L. Hall WES	WESLIB ECPL	713-F3-R0-A17	G-635 TSS FORTRAN			
EFFRAM	Paul Laliberte William Holtham New England Div.		713-F7-D0-110	GE-400 BATCH FORTRAN IV	X		Computes joint deflections and member end forces which are subjected to joint displacements. The structure may be found on an elastic foundation.

2. U FRAME CHANNELS

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
SYMMETRICAL U-STRUCTURE ON AN ELASTIC FOUNDATION	W. M. Rankin R. L. Renner Leonard Gloeb St. Paul Dist.		713-G1-F5-050	G-225 BATCH FORTRAN II	X		The program will analyze a symmetrical U-shaped structure loaded symmetrically and supported on an elastic foundation.
BEAM ON ELASTIC FOUN-DATION	Joe Avant Albuquerque Dist.		713-J2-M0-122	G-225 BATCH FORTRAN IV		X	This program analyzes the base slab of a rigid "U" frame.
SINGLE DRYDOCK STRUCTURE ON ELASTIC FOUNDATION	Elex Alter Chicago Dist. Bill Ashton Rock Island Dist.		713-C8-F1-030	CDC 6400 BATCH FORTRAN IV	X		Analysis of a single drydock type wall (1-foot section) to determine base reactions, moments and shears for use in computing reinforcement requirements in the channel slab.
U-FRAME STRUCTURE DESIGN	James B. Gaines Malcom J. Babb Virginia Williams Mobile Dist.		713-S8-K5-180	UNIVAC 1108 BATCH FORTRAN IV	X		Provides a preliminary design of a reinforced concrete stilling basin or other concrete U-frame structure. Computes and prints out- 1) Member sizes 2) Forces & moments on members 3) Areas & perimeter of reinforcing steel required at various locations.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
DESIGN OF CHANNEL U-WALL	C. Stephenson Los Angeles Dist.		713-X6-L1-005	GE-437 CDC 7600	X		To design a reinforced concrete channel section for the case where the width of channel is less than twice the height of wall.
U-WALL REINFORCED CONCRETE CHANNEL DESIGN	J. D. Helmick San Francisco Dist.	ECPL	713-G2-L3-001	IBM 360 or GE-415 BATCH FORTRAN IV	X		Provides a rapid method of design for a cross-section of a reinforced U-Walled channel.
EFFRAM	Paul Laliberte William Holtham New England Div.		713-F7-D0-110	GE-400 BATCH FORTRAN IV	X		Computes joint deflections and member end forces which are subjected to joint displacements. The structure may be found on an elastic foundation.
EPVKS1	Tom Jeffus Fort Worth Dist.		713-G9-M2-064	HONEYWELL G-400 BATCH G-635 TSS FORTRAN		X	Design of U-frame structure computes wall and slab moments and shears. Base pressure can be varied. SWD Standard.

3. GRAVITY MONOLITHS

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
STABILITY ANALYSIS - OVERFLOW GRAVITY DAM (DAMPAC)	Paul Laliberte William Holtham USAE Division New England	ECPL	713-F5-D0-105	GE-427 BATCH INFONET UNIVAC 1108	X		"Stability Analysis of Overflow Gravity Dam," with ogee spillway section. Program varies upstream slope or key depth to meet criteria. Base pressures are output.
OVERFLOW MONOLITH STABILITY	B. J. Halliburton Savannah Dist.		713-G1-K6-370	GE-225 BATCH FORTRAN II	X		Determines the stability of an overflow monolith at the plane of the base and at any horizontal plane up to and including the plane where the pier toe intersects the curve of the weir. The program will compute the stability of a weir only on ungated spillway with piers for bridge support, and a gated spillway with piers for bridge support, and a gated spillway with piers for bridge support, and a gated spillway. It will compute the stability for the constriction condition, normal operating condition, induced surcharge condition, flood discharge con- (continued)

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
OVERFLOW MONOLITH (continued)							dition, and a maintenance condition all simultaneous or either one or ones as desired.
OVERFLOW STABILITY ANALYSIS	Dean B. Englund Tulsa Dist.	ECPL	713-G1-M0-050	G-225 BATCH FORTRAN	X		This program computes the uplift pressures, the horizontal thrust, the crest pressure, the bucket forces, the resistances to sliding and the base pressure for a controlled or uncontrolled ogee weir monolith.
THEORETICAL SECTION OF NON-OVERFLOW MONOLITH	K. R. Koller S. A. Williams St. Louis Dist.		713-R3-A3-090	Converted to G-400 BATCH FORTRAN	X		Program is designed to determine a theoretical profile for a non-overflow monolith of a concrete gravity dam. The program computes the theoretical section, a section that is stable and is safe against sliding, and a practical section can be determined from the results.
NON-OVERFLOW MONOLITH STABILITY ANALYSIS	Tom Mudd St. Louis Dist.		713-R3-A3-400	RCA 301 Converted to G-400 BATCH FORTRAN	X		Program analyzes one-foot slice of a non-overflow monolith for stability sliding 4 base pressures.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
STABILITY ANALYSIS OF NON-OVERFLOW GRAVITY DAM (DAMPAC)	Paul Laliberte William Holtham USAE Division New England	ECPL	713-F5-D0-100	GE-427 BATCH INFONET UNIVAC 1108 FORTRAN IV	X		Stability analysis of non-overflow gravity dam, including sliding and overturning. Upstream slope and key depth vary to meet criteria.
STRESS ANALYSIS OF NON-OVERFLOW GRAVITY DAM (DAMPAC)	Paul Laliberte William Holtham USAE Division New England	ECPL	713-F5-D0-101	GE-427 BATCH INFONET UNIVAC 1108 FORTRAN IV	X		This program computes end stress at any specified elevation within a non-overflow gravity dam section. Stresses are also computed at the ends of an opening (i.e., gallery) if located at the elevation specified. Vertical and inclined compressive stresses and shear stresses are output.
3-D STABILITY ANALYSIS - NON-OVERFLOW GRAVITY DAM (DAMPAC)	Paul Laliberte William Holtham New England Div.	ECPL	713-F5-D0-102	GE-427 BATCH INFONET UNIVAC 1108 FORTRAN IV	X		Investigates sliding and overturning stability of a complete monolith with either a horizontal or irregular shaped base.
GRAVITY DAM STABILITY PROGRAM NON-OVERFLOW SECTION (STABAN)	Paul D. Breeding James W. Dahlen Seattle Dist.		713-D5-G3-040	IBM 360/50 BATCH FORTRAN	X		Gives a complete stability analysis for all six loading conditions as defined by the U. S. A. C. E. manual EM 1110-2-2200, 25 Sep 1958.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
NON-OVERFLOW OR INTAKE MONOLITH STABILITY	B. J. Halliburton Savannah Dist.		713-G1-K6-380	GE-225 BATCH FORTRAN II			Determines forces, moments and location of the resultant for either a non-overflow or intake monolith. Computes the stability at any given horizontal plane through the monolith as well as at the base. Wind, wave, headwater, tailwater, upstream soil, downstream soil, uplift, mass forces, and base stresses are all computed.
NON-OVERFLOW STABILITY ANALYSIS*	F. Webster G. Henson Tulsa Dist.	ECPL	713-G1-M0-060	G-225 BATCH FORTRAN	X		This program computes the information necessary to analyze the stability of a non-overflow section.
K C RETAINING WALL DESIGN	Marion Harter Byron Bircher Kansas City Dist.		713-F5-C1-030	HONEYWELL G-437 BATCH FORTRAN	X		Design of cantilever and gravity walls.
RECTANGULAR CONCRETE GATE WALL DESIGN	R. L. Lapp Kansas City Dist.		713-F1-F5-070	G-225 BATCH FORTRAN II		X	The program defines required thickness of concrete and amount of steel reinforcement at any location in the structure.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
SPILLWAY AND PIER MONOLITH STABILITY ANALYSIS	K. R. Koller Joe Davis St. Louis Dist.		713-R3-A3-150	Converted to G-400 BATCH FORTRAN	X		Analysis of a spillway (W/Ogee weir) and pier monolith. Program compute the dead load and dead moment (about the heel) of the spillway and pier from their respective geometries.
GRAVITY DAM, PIER, AND SPILLWAY ANALYSIS	Marion Harter Byron Bircher Melvin Jewitt Roy Reed Kansas City Dist.		713-R3-C1-090	RCA 301 BATCH FORTRAN		X	Determines the overturning and sliding stability of any gravity overfall spillway structure that has either a horizontal or an irregular base.
GATED SPILLWAY STABILITY	Captain J. Gorman Schaffer, Jr. Virginia Williams Mobile Dist.		713-S8-K5-290	UNIVAC 1108 BATCH FORTRAN IV		X	Provides a 3-D stability investigation of an intermediate pier monolith.
UPLIFT	Morris Granaden Byron Bircher Kansas City Dist.		713-F5-C1-050	HONEYWELL G-437 BATCH FORTRAN	X		Computes uplift force and safety factor against uplift for the stilling basin structure, considering the basin to act as a monolithic unit.
STAB	Edward O"Neil WES	CORPS		HONEYWELL G-635 TSS FORTRAN			

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
GRAVITY LOCK WALL STAB 1' SECTION	Elex Alter Chicago Dist.		713-C8-F1-010	IBM 7044 BATCH FORTRAN IV	X		Analysis of a gravity lock wall to determine base reactions, sliding factor, and percent of base under compression.
GRAVITY LOCK WALL MONO STABILITY	Elex Alter Chicago Dist.		713-C8-F1-020	CDC 6400 BATCH FORTRAN IV	X		Analysis of a gravity lock wall monolity to determine the base reactions, sliding factor and percent of base under compression.
LOCK WALL STABILITY MONOLITH INVESTIGATION	Charles W. Kling Virginia Williams Mobile Dist.		722-S8-K5-240	UNIVAC 1108 BATCH FORTRAN	X		Provides a 3-D static stability investigation of most lock wall monoliths.
LOCK WALL STABILITY ANALYSIS #	CPT Camden W. McConnel Carl A. Johnson Rock Island Dist.		713-G1-F4-44A	HONEYWELL G-225 BATCH G-437 TSS & BATCH G-635 TSS & BATCH INFONET UNIVAC 1108 FORTRAN	X		3-Dimensional Analysis of lock wall monoliths, land, intermediate, and river walls with or without gate loads.
LOCK WALL STABILITY ANALYSIS**	CPT Camden W. McConnell Carl A. Johnson Rock Island Dist.		713-G1-F5-120	G225 BATCH G-437 TSS BATCH G-635 TSS BATCH INFONET UNIVAC 1108 FORTRAN II	X		Stability analysis of navigation lock walls for loading cases given in EM 1110-2-2602.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
LOCK WALL STABILITY ANALYSIS	W. R. Noullet L. R. Hoy Pittsburg Dist.		713-F7-H4-030 (713-24-030)	G-225 BATCH FORTRAN	X		Investigates lock walls for stability.
LOCK WALL STABILITY ONE-FOOT SECTION	Captain Gorman Schaffer, Jr. Virginia Williams Mobile Dist.		722-J2-K5-180	UNIVAC 1108 BATCH FORTRAN V Can be compiled on FORTRAN IV compiler	X		A 2-D static investigation of a typical lock-wall chamber section and modifies the back slope of the section until the resultant of the normal loading conditions fall inside the resultant of forces and moments; base pressures and shear-friction safety factor; base pressure adjustmant if part of the base is not in compression for individual loading conditions.
LOCK WALL STABILITY†	W. E. Galyean Huntington Dist. Revised by: Barney Johnson Nashville Dist.		713-G1-H3-030 (713-23-030)	G-225 BATCH FORTRAN		X	Same as Land Walls program but with river or middle walls.
LAND WALL STABILITY	W. E. Galyean Huntington Dist. Revised by: Barney Johnson Nashville Dist.		713-G1-H3-020 (713-23-020)	G-225 BATCH FORTRAN		X	Finds resultant forces for land lock wall, with earthquakes.
STABILITY OF RIGID STRUCTURES	Tim Knight Omaha Dist.		713-M1-C2-410	G-437 FORTRAN BATCH		X	Analysis of structure for sliding and overturning.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
LOCK WALL ANALYSIS	J. P. D'Aniello Chicago Dist.		713-F5-F2-013	HONEYWELL G-425 G-635 BATCH FORTRAN IV	X		Analyzes the stability of a lock wall by determining the vertical and horizontal reactions and safety factors against sliding and overturning.
GRAVITY DAM STABILITY 1 ††	Paul D. Breeding Seattle Dist. L. R. Hoy Pittsburgh Dist.		713-F7-H4-050 (713-24-050)	G-225 BATCH FORTRAN	X		Analysis overflow gravity sections.
GRAVITY DAM STABILITY ANALYSIS	John Penzien Kenneth Harvey Alaska Dist.		713-D5-G1-040	IBM 360/50 BATCH FORTRAN	X		This program uses the Finite Element Paint Method for gravity dam stability analysis and can be used for design of any gravity dam non-overflow and spillway sections.
POWERHOUSE STABILITY ANALYSIS	R. L. Willey North Pacific Div.		713-D5-G0-010	IBM 360 BATCH FORTRAN IV		X	The program analyzes the loads acting on a powerhouse for evaluation of its stability.
POWER HOUSE STABILITY	Jack Hoffmeister Nashville Dist.		713-G1-H3-070 (713-23-070)	G-225 BATCH FORTRAN		X	Loads a power house and find bearing pressures.
TOWER STABILITY	Byron Bircher Kansas City Dist. Morris Ganaden		713-F5-C1-070	G-437/ Remote BATCH FORTRAN	X		Complete stability analysis including foundation pressures are provided for a typical intake tower.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
SAP IV#	Ed Wilson, UC Bill Boyt WES	WESLIB ECPL	713-F3-R0-012	G-635 BATCH FORTRAN	X		3-D Structural analysis program for linear systems. Use finite elements for static and dynamic problems with approximate modeshapes for the dynamic option. Includes SAPPILE and SAPBEAM, graphics pre-post-processing.
2-D STABILITY ANALYSIS	James E. Krussel Walla Walla Dist		713-K5-G4-400	IBM 360/50 BATCH or TS	X		Analyzes a monolith with or without applied loads for stability in two dimensions.
FINITE ELEMENT METHOD STRESS ANALYSIS	Dr. Ray Claugh Dr. Edward Wilson Univ. of Calif. Berkeley, CA Marvin Brammer Walla Walla Dist.		713-K5-G4-710	IBM 360/50 BATCH	X		Finite element techniques to determine internal displacements and stresses in 2-D plane stress or plane strain problems.
FINITE ELEMENT EQUILIBRIUM MODEL PLANE STRESS PLANE STRAIN	George W. Ploudre James W. Dahlen Seattle Dist.		713-K5-G3-480	IBM 360/50 BATCH FORTRAN	X		Offers an accurate solution to the plane problem without any restrictions as to the shape of the plate.

* Also available from H. Wayne Jones at the Waterways Experiment Station.
** Also available from St. Paul District (713-G1-F5-010).
† Also available from Huntington District (713-G1-H1-011).
†† Also available from Seattle District (713-K5-G3-040).
\# Also available from Sacramento District (713-X6-L2-21A).

4. MITER GATES

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
HORIZONTAL GIRDER ANALYSIS	Jack Hoffmeister Nashville Dist.		713-G1-H3-040 (713-23-040)	G-225 BATCH FORTRAN		X	Useful for miter gates, computes axial stresses, allowable bending compressive stress of stem, and combined stresses.
SKNPL - SKIN PLATE SYSTEM DESIGN ANALYSIS (X0019 in CORPS)	W. A. Price WES	CORPS WESLIB ECPL	713-F3-M3-510	G-635 TSS FORTRAN	X		Analysis and/or design of an orthogonal, planar steel skin plate and composite Tee rib system.
COMPUTER-AIDED DESIGN OF HORIZONTALLY FRAMED MITER GATES (MITER)	William Boyt WES	WESLIB ECPL	713-F3-R0-002	G-635 TSS FORTRAN	X		The program MITER was developed for the computer-aided design of horizontally framed miter gates with a miter of 1 on 3.
MITER GATE DESIGN	C. J. Grande, Jr. Mobile Dist.	ECPL	713-S8-D5-300	UNIVAC 1004-1108 G-225 G-400 FORTRAN IV	X		"Miter Gate Design." Automation of EM 1110-2-2603, Lock Gates (draft).

5. SECTOR, LIFT, OTHER GATES

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
ANALYSIS OF VERTICAL LIFT GATE	D. L. Phillips Jacksonville Dist.		GS 10	GE 225 BATCH FORTRAN IV	X		Analyzes the structural ability of a vertical lift gate by computing the moments, reactions, and stresses within the gate and the roller reactions, on the gate which result from specified loading conditions.
ANALYSIS OF GRIDS BY DIRECT STIFFNESS (GRID) (X0004 in Corps)	William Ashton Rock Island Dist.	CORPS WESLIB	713-F3-F4-01D	HONEYWELL G-635 TSS & BATCH HONEYWELL G-437 TSS & BATCH INFONET UNIVAC 1108 TSS & BATCH FORTRAN	X		Grid analysis by direct stiffness. The individual grid element stiffness matrix is transferred to the grid structure coordinate system and modified for specified boundary restraints. These are added to form total structure stiffness matrix. Data can be entered interactively or from a data file.
SKNPL - SKIN PLATE SYSTEM DESIGN ANALYSIS (X0019 in CORPS)	W. A. Price WES	CORPS WESLIB ECPL	713-F3-M3-510	G-635 TSS FORTRAN	X		Analysis and/or design of an orthogonal, planar steel skin plate and composite Tee rib system.

6. TAINTER GATES

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
COMPUTATION OF FORCES ON TAINTER GATE AND TRUNNION PIN (GFRAME)	Jon W. Eckles St. Louis Dist.		713-G1-A3-110	HONEYWELL G-225 BATCH updated to G-600 FORTRAN	X		The program performs a static analysis of a Tainter Gate assembly, accounting for various forces encountered in its operation.
TAINTER GATE ANALYSIS AND DESIGN	Marion M. Harter Roy D. Reed Ervell A. Staab William Morris Kansas City Dist.		713-R3-C1-240	RCA 301 FORTRAN		X	Four Subroutines: (1) Interior Rib Design - Determine the location of girders supporting the ribs, rib shears and moments and some of the geometry. (2) Exterior Rib Design - Determines shears and moments for the exterior ribs due to load from lifting cable. (3) Rigid frame and stress analysis - determines forces, stresses, and deflections in a frame consisting of the girder supporting the ribs and two struts transmitting the loads to the trunnion. (4) Tainter gate reactions at various gate openings when supported equally with cables.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
LOCATION OF TAINTER CREST GATE SILL	William Galyean Huntington Dist.		713-G1-H1-061	G-225 BATCH FORTRAN	X		The program was develto provide a solution for the intercept location of the circular arc of a tainter gate and the curve of the sill profile equation is: (F)$y = x^{1.85}$.
WEIGHT & C. C. OF TAINTER CREST GATE	W. E. Galyean Huntington Dist.		713-G1-H1-071 (713-21-071)	G-225 FORTRAN	X		Determines weight & centroid for tainter crest gates.
DESIGN OF THREE GIRDER TAINTER GATE	W. E. Galyean Huntington Dist.		713-F5-H1-102 (713-H1-102)	GE-440 FORTRAN	X		Selects strut & girder sides to provide optimum design for the combination of 3 frames.
TAINTER GATE FRAME DEFLECTION AND TEMPERATURE	W. E. Galyean Huntington Dist.		713-G1-H1-121 (713-21-121)	G-225 BATCH FORTRAN		X	Determines deflection and temperature stresses for applied loading.
THREE GIRDER TAINTER GATE OPTIMUM GIRDER SPACING	W. E. Galyean Huntington Dist.		713-G1-H1-311 (713-21-311)	G-225 BATCH G-635 FORTRAN	X		Computes girder spacing which will balance negative moments.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
SKNPL - SKIN PLATE SYSTEM DESIGN ANALYSIS (X0019 in CORPS)	W. A. Price WES	CORPS WESLIB ECPL	713-F3-M3-510	G-635 TSS FORTRAN	X		Analysis and/or design of an orthogonal, planar steel skin plate and composite Tee rib system.
INTERSECTION OF SPILLWAY AND TAINTER GATE	Harold Willet Savannah Dist.		713-G1-K5-140	GE-225 BATCH FORTRAN IV		X	Computes the coordinates of the point of intersection of Tainter Gate and Spillway and the angle between the vertical and tangent to the point of intersection.
TAINTER GATE LOADS AND REACTIONS *	D. B. Englund Tulsa Dist.	ECPL	713-G1-M0-010	G-225 BATCH G-635 TSS FORTRAN	X		This program computes the sill location and slope, the dead load sill reactions, the dead load trunnion reactions, the wave loads, the wave load trunnion reactions, the trunnion reactions due to hydrostatic load. The cable pull, angle of pull, the location and length of contact and reactions due to cable pull are given for overwound and underwound hoist. Produces a summation of trunnion reactions for various cases.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
TWO GIRDER TAINTER GATE INTERIOR RIB ANALYSIS*	D. B. Englund Tulsa Dist.	ECPL	713-G1-M0-020	G-225 BATCH G-635 TSS FORTRAN	X		This program computes for a two girder tainter gate, the optimum girder spacing and the moments, shears, and reactions of the interior ribs.
TAINTER GATE EXTERIOR RIB ANALYSIS*	D. B. Englund Tulsa Dist.	ECPL	713-G1-M0-030	G-225 BATCH G-635 TSS FORTRAN	X		Program computes the moments, shears, and reactions for the exterior rib of a 2, 3, or 4 girder tainter gate under normal and stall torque cable tension.
TAINTER GATE RIGID FRAME ANALYSIS*	D. B. Englund Tulsa Dist.	ECPL	713-G1-M0-040	G-225 BATCH G-635 TSS FORTRAN	X		This program the moments, reactions, axial loads and unit stresses for a tainter gate frame comprised of one (1) girder and two (2) struts.
OVERFLOW STABILITY ANALYSIS*	D. B. Englund Tulsa Dist.	ECPL	713-G1-M0-050	G-225 BATCH FORTRAN	X		This program computes the uplift pressures, the horizontal thrust, the crest pressure, the bucket forces, the resistance to sliding and the base pressures for a controlled or uncontrolled ogee weir monolith.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
NON-OVERFLOW STABILITY ANALYSIS*	F. Webster G. Henson Tulsa Dist.	ECPL	713-G1-M0-060	G-225 BATCH FORTRAN	X		This program computes the information necessary to analyze the stability of a non-overflow section.
FOUR-GIRDER TAINTER GATE INTERIOR RIB *	D. B. Englund Tulsa Dist.	ECPL	713-G1-M0-070	G-225 BATCH G-635 TSS FORTRAN	X		This program computes for a four-girder tainter gate, the optimum girder spacing and the moments, shears, and reactions of the interior ribs.
THREE-GIRDER TAINTER GATE INTERIOR RIB ANALYSIS *	D. B. Englund Tulsa Dist.	ECPL	713-G1-N0-080	G-225 G-635 TSS FORTRAN	X		This program computes for a three-girder tainter gate, the optimum girder spacing and the moments, shears, and reactions of the interior ribs.
(TGDA) COMPUTER-AIDED DESIGN/ANALYSIS OF TAINTER GATES	W. A. Price W. L. Boyt R. L. Hall H. W. Jones J. M. Jones	WESLIB ECPL	713-F3-R0-022	HONEYWELL G-635 TSS FORTRAN	X		A comprehensive program to do the engineer"s routine work, code checking, member selection, costing, and calculations: Geometry Live Loadings (11), Gate Weights, Girder Angles, Skin Plate-Rib System, Girder-Strut Frames.

* Also available from H. Wayne Jones at Waterways Experiment Station.

7. TRASH RACKS

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
ANALYSIS OF GRIDS BY DIRECT STIFFNESS (GRID) (X0004 in Corps)	William Ashton Rock Island Dist.	CORPS WESLIB	713-F3-F4-01D	HONEYWELL G-635 TSS & BATCH HONEYWELL G-437 TSS & BATCH INFONET UNIVAC 1108 TSS & BATCH FORTRAN	X		Grid analysis by direct stiffness. The individual grid element stiffness matrix is transferred to the grid structure coordinate system and modified for specified boundary restraints. These are added to form total structure stiffness matrix. Data can be entered interactively or from a data file.

8. SINGLE CELL CONDUITS AND CULVERTS

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
BOX CULVERT DESIGN ONE CELL	Walter Miller Vicksburg Dist.	ECPL	713-G9-A4-060	G-425 BATCH FORTRAN	X		This program was developed to analyze a 1-cell box culvert section for moments, shears, thrusts, and steel areas. The analysis is made by the moment distribution methods.
BOX CULVERT DESIGN ONE CELL	W. T. Miller Vicksburg Dist. Rev. By: Terry Johnson Gerald L. Cohen St. Paul Dist.		713-G1-F5-110	GE-225 BATCH FORTRAN II	X		The program determines the minimum thickness of the horizontal and vertical members and the area of reinforcing steel to provide for moment and the required factor of safety for cracking load for shear.
CONCRETE BOX CULVERT FRAME ANALYSIS AND DESIGN** ***	J. L. Miller Albuquerque, NM William Galyean Huntington Dist.		713-F3-H1-111	G-400 BATCH FORTRAN	X		This program provides a rapid analysis and design of simple frame reinforced concrete structures, inclosing concrete conduits or culverts under high fills and a variety of other structures with pinned or fixed ends.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
CULVERT DESIGN	Larry Colbert North Carolina Division of Hwys Rev. By: Fred Kitchens Savannah Dist.		713-G1-K6-500	GE-225 BATCH FORTRAN II			Designed single or multiple box culvert, knowing the span height and fill. It will also give the bar schedule as an option, knowing the length and end skews.
BOX CULVERTS	L. A. Colbert North Carolina Division of Hwys Larry Mitchel Wilmington Dist.		713-K8-K7-090 (713-090)	IBM 360/75	X		Designs reinforced concrete box culverts.
CULVERT ANALYSIS	C. Stephenson Los Angeles Dist.		713-X6-L1-003	GE-437 CDC 7600	X		To analyze a single, double, or triple box culvert section by culvert distribution. Program fixed and moments and simple beam ( ) moment for dead load, lateral earth pressure, live load and live load surcharge. Program may also be used to distribute moments due to any other loading conditions, e.g., internal water load concentrated loads, etc., if the fixed and moments and simple beam ( ) moments are entered in addition to or in place of loading conditions. Sideaway is computed for every condition.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
FLEXIBLE CULVERT PIPE-ARCH ANALYSIS	J. L. Miller T. A. Heldt Albuquerque Dist.		713-J2-M1-010	IBM 1620 G-225 BATCH FORTRAN		X	The program uses the compression ring theory to compute seam strength, soil pressures, and gauge of pipe required.
INDETERMINATE FRAME ANALYSIS (CONCRETE BOX CULVERT AND DESIGN)*	J. L. Miller Albuquerque Dist.		713-G1-M1-070	IBM 1620 BATCH HONEYWELL H-222 G-437 BATCH G-635 TSS FORTRAN	X		The program provides a rapid analysis and design of simple frame reinforced concrete structures, inclosing concrete conduits or culverts under high fills and a variety of other structures with pinned or fixed ends.
SINGLE HORSESHOE, ARCH, AND MODIFIED OBLONG CONDUIT DESIGN #	Harry Beyer Byron Bircher Kansas City Dist.		713-F5-C1-01A	G-225 REMOTE BATCH G-437 FORTRAN			This program performs a completely automatic structural design or review of a horseshoe, arch, or modified oblong conduit.
CIRCULAR & OBLONG CONDUIT DESIGN #	Marion Harter J. L. Goering Byron Bircher Harry Beyer Kansas City Dist.		713-F5-C1-01B (713-R3-C122)	HONEYWELL G-437 BATCH FORTRAN			This program performs a completely automatic structural design or review of an oblong or circular conduit.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
VOUSSIOR CONDUIT DESIGN	Brockman Omaha Dist.		713-M1-C2-390	HONEYWELL G-437 BATCH FORTRAN	X		A conduit analysis program in three segments with the primary references being: 1. PCA analysis of arches, rigid frames, and sewer section. 2. EM 110-2-2901 conduit, culvert, and pipe.
OBLONG CONDUIT STRUCTURE ANALYSIS AND DESIGN	G. L. Cohen M. B. Downs St. Paul Dist.		713-G1-F5-080	G-225 BATCH FORTRAN II		X	The purpose of this program is to define the required thickness of concrete and amount of steel reinforcement at any location in the oblong conduit for design purposes.
CONDUIT ANALYSIS	Bob Alder St. Louis Dist. W. E. Galyean Huntington Dist.		713-G1-H1-471 (713-21-471)	G-225 BATCH FORTRAN	X		Analyze conduit sections with varying loads.
STRESS ANALYSIS OF TUNNEL OR CONDUIT	W. D. Barnes Huntington Dist.		713-F5-H1-481 (713-H1-481)	GE-440 FORTRAN	X		Stress analysis of a concrete tunnel conduit.
VARIABLE SECTION CONDUIT ANALYSIS	Joseph Hill John Tang Tulsa Dist. E. G. Metka Louisville Dist.		713-F3-H2-090 (713-H2-090)	G-225 BATCH FORTRAN	X		To determine moments, shear, thrust, concrete stress, and required steel area for a conduit of variable section with water and/or earth loading.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
VARIABLE SECTION CONDUIT ANALYSIS	E. G. Metka Louisville Dist.		713-D2-H2-230	HONEYWELL G-225 BATCH FORTRAN	X		The program was written to design a variable section conduit with water and/or earth loading.
CIRCULAR OR OBLONG SHAPE CONDUIT DESIGN UNDER HIGH FILLS.	Fred Kitchens Bob Halliburton Savannah Dist.		713-G1-K6-350	GE-225 BATCH FORTRAN II		X	Computes the moments, thrusts, shears, steel required, concrete stress, steel stress and diagonal tension stress at 15-degree increments around the conduit for a given radius, concrete and loading conditions.
DESIGN OF SINGLE RECTANGULAR REINFORCED CONCRETE CONDUIT	C. Stephenson Los Angeles Dist.		713-X6-L1-001	GE-437 CDC 7600	X		Program designs rectangular reinforced concrete conduits subject to various internal and external loads. Computes the following values: Fixed end moments, distributed moments, shear thrust, reactions, required effective depth of slabs and walls, design moments, K values required steel areas, required parameter of steel, and final thickness of slabs and walls. Program may also be used for investigation.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
ULTIMATE-STRENGTH ANALYSIS OR DESIGN OF VARIABLE-SECTION CONDUITS	C. A. Rich G. G. Romero T. F. Heidt,Jr. Albuquerque Dist.	ECPL	713-G1-M0-090	G-225 BATCH FORTRAN II	X		This program computes moments, thrust, shears, and factors of safety in shear, and combined axial load and flexure in single-barrel reinforced concrete conduits under high fills. (SWD Standard)
(ORTCUL) RECTILINEAR CULVERT/CONDUIT ANALYSIS AND/OR DESIGN	P. K. Senter W. A. Price WES (started by Galveston Dist.)	WESLIB	713-F3-M3-070	G-635 Timesharing Fortran	X		CASE Committee Interim recommended program for Rectilinear culverts. Follows EM 1110-2-2902, with Loading Condition III. Considers support stiffness. USD Concrete Design 1-9 barrel box shape.
(CURCON) CURVILINEAR CULVERT/CONDUIT ANALYSIS AND/OR DESIGN	M. M. Harter B. E. Bircher	WESLIB		G-635	X		CASE Committee recommended interim program. The program performs the analysis or design of conduits having various cross-section types. The allowable geometries include horseshoe, modified oblong, arch, oblong with constant thickness, oblong with gravel or lean concrete fillets, or oblong with a square base. Circular conduits are included as special cases of the oblong type. Vertical and horizontal load effects associated with fill, phreatic and pool elevations are analyzed.

*Also available from Huntington District (713-F3-H1-111).

**Also available from H. Wayne Jones at the Waterways Experiment Station.

***Also available from Albuquerque District (713-G1-M1-070).

#Combined into program CURCON in userid ROKACASECON - - Call P. K. Senter at WES for info.

9. MULTIPLE CELL CONDUITS

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
BOX CULVERT DESIGN FOUR CELL	Walter Miller Vicksburg Dist.		713-G9-A4-010	G-425 BATCH FORTRAN		X	This program was developed to analyze a 4-cell box culvert section for moments, shears, thrusts and steel areas. The analysis is made by moment distribution methods.
BOX CULVERT DESIGN THREE CELL	Walter Miller Vicksburg Dist.		713-G9-A4-030	G-425 BATCH FORTRAN		X	This program was developed to analyze a 3-cell box culvert section for moments, shears, thrusts and steel areas. The analysis is made by the moment distribution methods.
BOX CULVERT DESIGN TWO CELL	Walter Miller Vicksburg Dist.		713-G9-A4-070	G-425 BATCH FORTRAN		X	This program was developed to analyze a 2-cell box culvert section for moments, shears, thrusts, and steel areas. The analysis is made by the moment distribution methods.
MULTI-CELL BOX CULVERT	Walt Diely Omaha Dist.		713-M1-C2-380	G-437 BATCH FORTRAN	X		Analyze frames having variable cross sections.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
FLEXIBLE CULVERT PIPE-ARCH ANALYSES	Jack L. Miller/ Thomas A. Heldt Albuquerque District		713-J2-M1-010	IBM 1620 G-225 BATCH FORTRAN		X	The program uses the compression ring theory to compute seam strength, soil pressures, and gauge of pipe required.
INDETERMINATE FRAME ANALYSIS (CONCRETE BOX CULVERT AND DESIGN)* ***	Jack L. Miller Albuquerque District		713-G1-M1-070	IBM 1620 BATCH HONEYWELL G-222 G-437 BATCH G-635 TSS FORTRAN	X		The program provides a rapid analysis and design of simple frame reinforced concrete structures, inclosing concrete conduits or or culverts under high fills and a variety of other structures with pinned or fixed ends.
BOX CULVERT MOMENTS AND SHEARS	John Harberg Omaha Dist.		713-M1-C2-38A	G-437 BATCH FORTRAN		X	Computes reinforcing steel requirements for multi cell box culvert as analyzed by the above program.
TWIN BOX CULVERT DESIGN	Iowa State Hwy. Commission William Ashton Rock Island Dist.		713-G1-F4-38A	G-225 BATCH FORTRAN II	X		Analysis of twin barrell reinforced box culverts.
CONCRETE BOX CULVERT FRAME ANALYSIS AND DESIGN**	Jack L. Miller Albuquerque, N.M. William Galyean Huntington Dist.		713-F3-H1-111	G-400 BATCH FORTRAN	X		This program provides a rapid analysis and design of simple frame reinforced concrete structures, inclosing concrete conduits or culverts under high fills and a variety of other structures with pinned or fixed ends.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
BOX CULVERTS	Larry A. Colbert, North Carolina Division of Hwys. /Larry Mitchel, Wilmington Dist.		713-K8-K7-090 (713-090)	IBM 360/75	X		Designs reinforced concrete box culverts.
CULVERT ANALYSIS	C. Stephenson Los Angeles Dist.		713-X6-L1-003	GE 437 CDC 7600	X		To analyze a single, double, or triple box culvert section by moment distribution. Program computes fixed end moments and simple beam (S) moment for dead load, lateral earth pressure, live load and live load surcharge. Program may also be used to distribute moments due to any other loading condition, e.g., internal water load concentrated loads, etc., if the fixed end moments and simple beam (S) moments are entered in addition to or in place of loading conditions. Sidesway is computed for every condition.
ANALYSIS OF TWO-DIMENSIONAL FRAME STRUCTURES† (X0020 in CORPS)	W. P. Doherty E. L. Wilson Univ. of Calif. Revised by: J. D. Rafferty: San Fran. Dist.	ECPL	713-G2-L3-002	IBM 360 G-415 WES G-635 TSS	X		This program provides an analysis of general two-dimensional frame problems.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
TOWER STABILITY	Byron Bircher Kansas City Dist. Morris Ganaden		713-F5-C1-070	G-437/ REMOTE BATCH FORTRAN	X		Complete stability analysis including foundation pressures are provided for a typical intake tower.
GFRAME (X0006 in CORPS)	Robert Brittian Memphis Dist. or Clinton Word Galveston Dist.	CORPS WESLIB ECPL	713-F5-A1-040	HONEYWELL G-437 BATCH	X		The program determines the joint displacements and rotations, member end moments shears and axial loads and structural reactions for planar rigid structures.
EFFRAM	Paul R. Lalibert William Holtham New England Division		713-F7-D0-110	GE-400 BATCH FORTRAN IV	X		Computes joint deflections and member end forces which are subjected to joint displacements. The structure may be found on an elastic foundation.
MULTI-CELLED GATEWELL DESIGN	J. D. Rafferty San Francisco District		713-G2-L3-005	GE-400 BATCH FORTRAN	X		Incorporate the two-dimensinal frame analysis program. Determine concrete thickness and steel reinforcement at each design interval of wall length for a gatewell with a maximum of 5 cells.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
MOMENT DISTRIBUTION ON 1-3 CELLS	William Ashton Rock Island Dist.		713-G1-F4-71A	G-225 BATCH INFONET UNIVAC 1108 FORTRAN	X		3-cell moment distribution.
RECTILINEAR CULVERT/CONDUIT ANALYSIS AND/OR DESIGN	P. K. Senter W. A. Price WES (started by Galveston Dist.)	WESLIB	713-F3-M3-070	G-635 Timesharing Fortran	X		CASE Committee Interim recommended program for Rectilinear culverts. Follows EM 1110-2-2902, with loading Condition III. Considers support stiffness. USD Concrete Design 1-9 barrel box shape.

*Also available from Huntington District (713-F3-H1-111).
**Also available from H. Wayne Jones at the Waterways Experiment Station.
***Also available from Albuquerque District (713-G1-M1-070).
#Combined into program CURCON in userid ROKACASECON - - Call P. K. Senter at WES for info.

10. TUNNELS

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
ULTIMATE-STRENGTH ANALYSIS OR DESIGN OF VARIABLE-SECTION	Charles A. Rich Gerald C. Romero/ Thomas F. Heldt Albuquerque Dist.	ECPL	713-G1-M0-090	G-225 BATCH FORTRAN II	X		This program computes moments, thrust, shears, and factors of safety in shear, and combined axial load and flexure in single-barrel reinforced concrete conduits under high fills.
DESIGN OF CIRCULAR TUNNELS*	Jean LePage M. M. Harter and Richard Herndan Kansas City Dist. Revised by: Ed Stone Huntington Dist.		713-G1-H1-321 (713-21-322)	G-225 BATCH FORTRAN	X		Program determines the optimum dimensions of a reinforced concrete tunnel subject to given external loads. This tunnel is for use in the Outlet Works U.S.C.E. dams. The optimum dimensions are those: 1. Which generate the smallest units value of 2. Which develop moments, thrust, and shears that will produce unit stresses within designed limits.
GEOMETRY OF TUNNEL TRANSITION STRUCTURES FOR OUTLET WORKS†	Edward A. Stone Huntington Dist. Revised by: G. L. Cohen St. Paul Dist.		713-G1-F5-100	GE-225 BATCH FORTRAN II		X	This program computes the interior geometry for the transition between a two or three sluiced intake structure and a circular outlet tunnel.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
LINER	J. White Sacramento Dist.		713-G1-L2-02C	G-225 BATCH FORTRAN II	X		Program analyzes and/or designs cylindrical steel tunnel liners. For external pressure the shell is assumed to be confined in a rigid cavity; stiffener rings are incorporated as needed. For internal pressure, division of load between liner and rock is based upon OCE criteria established for New Melones Project. Plane strain is assumed.
TUNNEL SECTION ANALYSIS BY ELASTIC CENTER METHOD	Robert Haavisto Sacramento Dist.		713-G1-L2-48C	G-225 BATCH FORTRAN II		X	Program computes internal moments, thrusts and shears in a closed-rib type concrete tunnel section subject to external pressure. Analysis is by method of elastic centers, and is a modification of Metcalk and Eddy technique in the PCA pamphlet "Analysis of Arches Rigid Frames and Sewer Sections."
TUNNEL	G. S. Orenstein Thomas Mudd St. Louis Dist.	ECPL	713-F3-R0-019	H-635 TSS FORTRAN IV		X	Analyzes steel tunnel supports for shear, moment, thrust, and deflections.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
HORSHU	G. S. Orenstein Thomas Mudd St. Louis Dist.	ECPL	713-F3-R0-020	TSS		X	Generates some of input required for TUNNEL in the special case of horseshoe-shaped tunnel.

* Original from Kansas City District (13-J2-C1-08).
† Also available from Huntington District.

11. PILE FOUNDATIONS

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
HRENNIKOFF PILE ANALYSIS WITH SUMMATION OF RESULTS	R. Villarubia, G. M. Finley, C. W. Ruckstuhl D. J. Elguezabal New Orleans Dist.		713-F3-A2-150 Modification	G-635 TSS or BATCH FORTRAN		X	Computer actual axial and transverse loads, and allowable transverse loads, on each pile row for each set of applied forces and moments on a given pile arrangement of a battered pile foundation by the Hrennikoff Method.
HRENNIKOFF PILE METHOD	Lucian Guthrie OCE John Lambrecht Nashville Dist.		713-G1-H3-090 (713-23-090)	G-225 BATCH FORTRAN		X	Loads a group of piles, finds axial lateral per pile and displacements of footings.
PILE FOUNDATION ANALYSIS BY HRENNIKOFFS METHOD	P. Michael Boyd Rock Island Dist.		713-G1-F4-62A	G-200 BATCH FORTRAN	X		The load carried by each pile is proportional to the displacement of the pile head. All piles behave alike. The footing is rigid.
BATTER PILE ANALYSIS-HRENNIKOFF	R. W. Powers Thomas J. Durrence Savannah Dist.		713-G1-K6-020	GE-225 BATCH FORTRAN			Program computes the pile constants based on any pile section required to be used in further computation of the longitudinal and transverse loads, compiles three equations, solves them simultaneously for the reduced foundation (continued)

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
BATTER PILE ANALYSIS- HRENNIKOFF (continued)							movements and computes the axial load, shear and moment for the battered or vertical piles. Analysis is made for fixed and pinned end conditions.
3-D FOUNDATION ANALYSIS - PHI BATTER	Bill James Charles Marak Little Rock Dist.		713-G1-M413A	GE-225 FORTRAN	*		Determines the individual pile loads for a group of piles including battered and vertical piles.
3-D PILE FOUNDATION ANALYSIS - BETA BATTER	Little Rock Dist.		713-G1-M413B	GE-225 BATCH FORTRAN	*		Supplemental program to 713-G1-M413A. Specifications same except: Third Dimensional batter in perpendicular plane is added.
3-D PILE FOUNDATION ANALYSIS	H. C. Edgecombe New Orleans Dist.		713-F3-A2-210 Modification 6	G-600 TSS FORTRAN	X		The purpose of the program is to provide a three-dimensional analysis of a pile foundation. The general method of analysis is an expansion to 3-dimensions (by SAUL) of the Hrennikoff direct stiffness methods for a 2-D analysis.
3-D PILE FOUNDATION ANALYSIS (See also LMVDPILE)	H. C. Edgecombe New Orleans Dist.		713-F3-A2-210 Modification 7	G-635 TSS and REMOTE BATCH FORTRAN IV		X	Same as previous program except available in both time-sharing and remote access. Pile and pile type.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
IMPROVED 3-D PILE (X0014 in CORPS) (See also LMVDPILE)	Thomas J. Mudd Carl Smith St. Louis Dist.	CORPS WESLIB	713-F3-A3-30A	600 BATCH FORTRAN			Rigid base indeterminate pile analysis by Matrix. Computes pile combined axial and bending and compares to allowable.
LMVDPILE	Deborah Kaufman WES	WESLIB ECPL	713-F3-R0-026	G-635 TSS FORTRAN	X		Merged combination of 713-F3-A2-210 Mod 7 and 713-F3-A3-30A Hrennikoff pile programs with 3-D load and pile geometry.
INDETERMINATE PILE ANALYSIS 3-D BY MATRIX METHOD	Thomas Mudd St. Louis Dist. or Wayne Jones WES		713-F3-A3-840	G-635 TSS and BATCH FORTRAN IV	X		This program is general method of analysis by direct stiffness of 3-dimensional pile foundations. The pile foundation consists of a group of piling placed into the soil topped with a rigid cap. Loads to the caps are transmitted by the piling to the soil.
INDETERMINATE PILE ANALYSIS - 3D by MATRIX METHOD†	Thomas Mudd St. Louis Dist. E. G. Metka Louisville Dist.		713-F3-H2-160 (713-H2-160)	G-437 BATCH FORTRAN	X		General method of analysis by direct stiffness of 3-D pile foundations.
STRUCTURAL ANALYSIS OF CONCRETE U-FRAME LOCK ON PILES (2-D FLEX-PILE)	Edward Demsky St. Louis Dist.		713-F3-A3-910	HONEYWELL G-600/6000 FORTRAN TSS	X		Program performs an analysis of a two-dimension concrete U-frame lock on piles driven in sand.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
3-D PILE FOUNDATION ANALYSIS	Captain J. Gorman Schaffer, Jr./ Virginia Williams Mobile Dist.		713-S8-K5-280	UNIVAC 1108 BATCH FORTRAN IV	X		Provides analysis of pile foundations resisting 3-D forces. Batter pile are acceptable but the angles of batter are limited to one plane. A given pile foundation can be analyzed for a number of different loading conditions. The axial and transverse loads acting on any pile within the foundation can be found.
EQUIV. K FOR PILE IN STRATIFIED SOIL SYSTEM	C. W. Ruckstuhl New Orleans Dist.		713-F5-A2-250	GE-435 TSS Converted G-635 TSS FORTRAN IV		X	For a pile in a stratified soil system with different known values of module of horizontal subgrade reaction (constant and/or varying linearly with depth) computes a single equivalent value of constant modulus.
H K PILE (H PILE-REV PROGRAM)	H. W. Heslin Dani Ragsdale		741-F5-R0-002 (41-Z5-002)	HONEYWELL G-635 TSS FORTRAN	X		Pile foundation analysis using Hrennikoff's Method.
NEWPILE	Lee Sulzberger Memphis Dist.			HONEYWELL G-600 TSS FORTRAN	X		3-Dimensional Pile Analysis (by Matrix Analysis).

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
HPILE	Vicksburg Dist.		741-F5-R0-002	G-635 TSS		X	Two-dimension pile program utilizing Hrennikoff's method of analysis. Same as documented WES program HKPILE except data input from file. Unlike program HKPILE which prints out pile geometry each time a case analyzed in a "multi-case run, HPILE prints out geometry only once. These revisions greatly expediate analyses.
SAPPILE (Special Features are Included in "SAP IV")	H. W. Jones WES			G-635 BATCH FORTRAN	X		A modified general purpose structural analysis program (SAP4) with a three-dimensional pile element added: Good for analysis of 3-D flexible cap pile foundations.
PILE FOUNDATION ANALYSIS	John Lambrecht Nashville Dist.		713-23-091	G-225 BATCH FORTRAN		X	Loads a group of piles with various pile fixities and finds resultant forces.
SLAB, SHEARS, AND MOMENTS	J. P. Hartmann Carlton Smith St. Louis Dist.		713-F3-A3-900	HONEYWELL G-600/6000 TSS FORTRAN			This program uses pile forces, output from the indeterminate pile analysis program to calculate slab shears and moments.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
BENT1 (I0002 in CORPS)	(L. C. Reese UT Dr. Parker)	CORPS WESLIB	713-F3-R0-014	HONEYWELL G-635 TSS FORTRAN	X		Analysis of group pile behavior by finite difference University of Texas.
MAKE	(Dr. Parker) Radhakrishnan	WESLIB	713-F3-R0-016	G-600 TSS FORTRAN	X		Generates pressure vs movement curves for piles in sand or clay.
COM62 (I0001 in CORPS)	(L. C. Reese UT) Radhakrishnan	WESLIB	713-F3-R0-018	600 TSS	X		Analysis of piles with lateral and axial loads, University of Texas.
DUKEFOR	Duke University D. M. Holloway WES	ECPL	741-F3-R0006	600 BATCH	X		1D finite element simulation of pile driving and load testing behavior.
TAMFOR	Texas A&M Univ. D. M. Holloway WES	ECPL	741-F3-R0007	G-600 TSS FORTRAN	X		Pile driving analysis by the wave equation lumped parameter finite difference method.
PX4C3 (I0003 in CORPS)	(L. C. Reese UT Dr. Coyle TAM)	CORPS WESLIB	713-F3-R0-015	600 TSS FORTRAN	X		Load-settlement characteristic of axially loaded piles, University of Texas.

† Also available from St. Louis District (713-F1-A3-840).

12. SHEET PILE CELLS

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
(CELLSL) CELLULAR SHEET PILE STRUCTURE	Elex Alter Chicago Dist.	WESLIB	713-C8-F1-050	CDC 6400 BATCH FORTRAN IV G-600	X		CASE Committee Interim recommended program for design of a sheet pile cell or a parallel wall. Uses Cumming's method to determine an equivalent width with a tilting factor.
CANTILEVER SHEET PILE DROP STRUCTURE, COHESIONLESS SOIL	Marlin A. Munter St. Paul Dist.		713-G1-F5-090	G-225 BATCH FORTRAN II		X	This program will analyze a cantilever sheet pile drop structure which depends solely on its embedment in cohesionless soil for stability.
(CELLRK) CIRCULAR COFFERDAM MOORING CELL FOUNDED ON ROCK	Walter Green Randal Warren Nashville Dist.	WESLIB	713-G1-H3-190 (713-23-190)	GE-225 FORTRAN G-600	X		CASE Committee Interim recommended program for analysis of a given circular steel sheet pile cofferdam or mooring cell founded on rock, using methods presented in U. S. Steels "Steel Sheet Piling Design Manual".
COFFERDAM SLIDING STABILITY	Anton Krysa Pittsburg Dist.		713-F7-H4-300 (713-24-300)	G-225 BATCH FORTRAN	X		Investigates cofferdam sliding below rock.

13. SHEET PILE WALLS

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
CANTILEVER RETAINING WALL STABILITY (Q) & (S) CASES (I0007 in CORPS) (See also X0015)	Michael LaMarca New Orleans Dist.	CORPS WESLIB	741-F3-A2-370	G-635 TSS FORTRAN		X	Determines the penetration of a cantilever retaining wall subject to lateral forces that impart overturning moments. Computes lateral earth forces & overturning moments for each foot of depth and balances each to satisfy stability requirements of the method of planes.
CANTILEVER RETAINING WALL, STABILITY DESIGN	Arthur Johnson and James Worts Jon Eckles Gerald Schwalbe St. Louis Dist.		713-R1-A3-440	G-635 BATCH FORTRAN	X		The program is to design a one-foot section of a cantilever retaining wall. It allows for various water elevation on either side of the wall.
CANTILEVER SHEET PILE	Walt Diely Omaha Dist.		713-M1-C2-130	G-437 FORTRAN BATCH		X	Analyzes design of a cantilever retaining wall given the heights of sheet piling water levels.
CANTILEVER RETAINING WALL STABILITY ANALYSIS AND FINAL DESIGN	Arthur Johnson and James Worts Jon Eckles or Gerald Schwalbe St. Louis Dist.		713-R1-A3-450	G-635 BATCH FORTRAN	X		The problem is to analyze a one-foot slice of a cantilever retaining wall for stability and to design the area of steel required.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
CANTILEVER PILE MULTI-LAYER DESIGN W/WO/IMPACT OR WAVE FORCE	Elex Alter Chicago Dist.		713-C8-F1-060	CDC 6400 BATCH FORTRAN IV	X		Determine maximum moment and embedment elevation for a cantilever pile wall.
CANTILEVER SHEET PILE WALL	William Ashton Rock Island Dist.		713-F7-F4-41A	HONEYWELL G-225 BATCH G-635 TSS INFONET UNIVAC 1108 FORTRAN	X		This program analyzes a cantilever sheet pile wall in sand which depends solely on its embedment for stability.
CANTILEVER SHEET PILE WALL	William Ashton Rock Island Dist.		713-G1-F5-010	G-225 BATCH G-600 TSS INFONET 1108	X		This program will analyze a cantilever sheet pile wall in sand which depends solely on its embedment for stability. The program is written for the full flood condition.
CANTILEVER SHEET PILE DROP STRUCTURE, COHESIONLESS SOIL	Marlin A. Munter St. Paul Dist.		713-G1-F5-090	G-225 BATCH FORTRAN II	X		This program will analyze a cantilever sheet pile drop structure which depends solely on its embedment in cohesionless soil for stability
CANSHE	Hradilek and Lizardi Computer Science Corporation Raymond J. Pensak Los Angeles Dist.		Computer Sciences Corp. Terminal (INFONET)	FORTRAN IV for UNIVAC 1108 Computer	X		Computes stress and depth of penetration for cantilever sheet piling under soil and surcharge load.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
I-WALL ANALYSIS, FOUR SOIL ZONES**	Walt Diely Omaha Dist.		713-M1-C2-500	G-437 FORTRAN BATCH		X	Determines the loads on a "I" wall embedded in a maximum of 4 soil zones and subjected to a full flood.
BEAM (SHEAR, MOMENT, DEFLECTION) (BEAMNOD) (X0015 in CORPS)	Dennis J. Beer New Orleans Dist.	CORPS WESLIB	713-F5-A2-580	GE-400 TSS G-635 TSS		X	The program will select from a file and/or analyze a symmetrical straight member for any statically determinant one-dimensional load system which consists of transverse loads and/or couples. Companion program to I0007 in CORPS.
MATLOCKS RECURSIVE SOLUTION FOR BEAM COLUMNS (A71350)	Larry Farmer Univ. of Missouri Tom Mudd St. Louis Dist.	WESLIB	713-F3-A3-500	HONEYWELL G-600/6000 FORTRAN TSS	X		The program analyses beam-column problems, and provides answers that approximate classical solutions to similar problems. Program analyze a model consisting of interacting oars and springs and the solution is consistent with the similarity of the model with the problem to be analysed.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
BOUSSINESQ SURCHARGE PRESSURES ON RETAINING	Joseph Davis Jon Eckles Gerald Schwalbe St. Louis Dist.		713-R1-A3-690	G-635 BATCH FORTRAN	X		This program was written to provide the incremental and resultant pressures and moments arms active stem and heel.
SHEET PILE MULTILAYER DESIGN W/ TIEBACK	Elex Alter Chicago Dist.		713-C8-F1-070	CDC 6400 BATCH FORTRAN IV	X		Design a sheet pile wall - determine depth of embedment, the tieback force and maximum moment required with one or more layers of soil on both sides of wall.
(ANCWAL) ANCHORED BULKHEAD DESIGN BY NUMERICAL METHOD	M. S. Grazioli Detroit Dist.	WESLIB	713-G1-F3-010	G-225 BATCH FORTRAN II	X		CASE Committee Interim recommended program. The program designs an anchored bulkhead by four methods; Free Earth Support, Equivalent Beam, Elastic Line (Fixed Earth) and Equal Movement.
MISC. STEEL DESIGN	M. S. Grazioli Detroit Dist.		713-G1-F3-030	G-225 BATCH FORTRAN II			To design the Miscellaneous Steel required for an Anchored Steel Sheet Piling Wall. The program designs the Tie Rods, Wales Machine Bolts, Spreader Plates and Splice Plates.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
CONTINUOUS STEEL SHEET PILING ANCHOR WALL	R. R. Doebler Detroit Dist.		713-G1-F3-050	G-225 BATCH FORTRAN II			To determine the depth of penetration and required section of a steel sheet piling anchor wall. If the point of zero moment on the front wall is given, the length of tie rod is also computed.
PACKSHAW METHOD OF DESIGN FOR SSP BACK-WALL	M. Grazioli, P. Kytasty L. Marchinda Detroit Dist.		713-G1-F3-070	G-225 BATCH FORTRAN II			To determine the length and strength of the backwall of a dual walled cofferdam. The program is useful for design of continuous anchor wall placed at a distance closer to the bulkhead than normally required. Can also solve a cantilever SSP wall by specifying Tie Rod Force = 0 and cell width extremely wide.
(CANWAL) CANTILEVER RETAINING WALL DESIGN AND ANALYSIS	L. Manson, Jr. New Orleans	WESLIB		G-600	X		Case Committee Interim recommended program. Determines, by the method of planes, the penetration of a cantilever retaining wall subjected to lateral forces. The program analyzes the wall as a cantilever beam fixed at the theoretical depth of penetration, and determines shears, bending moments and deflections for each foot of wall. Combination of programs I0007 and X0015.

** Also available from St. Louis District (713-G1-A3-020).

14. L-WALLS AND T-WALLS

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
FLWALL	Lee Sulzberger Memphis Dist.			HONEYWELL 600 TSS FORTRAN		X	Analysis of floodwalls for overturning and sliding. Uses Rankine earth pressures for overturning and method of planes for sliding.
FORCES ON INVERTED T-WALL	C. W. Ruckstuhl New Orleans Dist.		713-F5-A2-110	GE-430 TSS updated to G-635 FORTRAN IV		X	Program computes summation of forces and moments on inverted concrete T-Wall for each of a given number of load conditions. Computes magnitude, location, and direction of the resultant for each load condition.
COMPUTATION OF APPLIED FORCES AND MOMENTS ON AN INVERTED, VARIABLE DEPTH T-WALL	Leroy Brown New Orleans Dist.		713-F3-A2-160	HONEYWELL G-600 TSS FORTRAN IV	X		The purpose of this program is to compute the total applied forces and moments on an inverted T-Wall is divided into segments, forces, and moments are computed for each segment and accumulated algebracally to obtain the totals for each case.
T-WALL DESIGN	Detroit Dist.		713-G1-F3-040	G-225 BATCH FORTRAN			

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
T-FLOOD WALL**	Michael Downs St. Paul Dist. S. A. Williams St. Louis Dist. Revised by: Michael B. Downs Gerald Cohen St. Paul Dist. Walt Diely Omaha Dist.		713-M1-C2-370	G-437 BATCH FORTRAN	X		Determines the structural members and shears distribution required for the design ot a T-type floodwall. Analyzes T-type floodwall for overturn stability based on criteria given in EM 01110-2-2501.
T-TYPE RETAINING WALL	S. A. Williams Revised by: Gerald Cohen St. Paul Dist.		713-C1-F5-040	G-225 BATCH G-437 TSS BATCH G-635 TSS BATCH INFONET *UNIVAC 1108* FORTRAN	X		This program obtains an optimum section of a T-Type retaining wall as required for overturning stability for a given loading condition and determines the base pressure moments, and shear for use in designing the wall components.
T-TYPE FLOOD WALL	S. A. Williams St. Louis Dist. Leonard Gloeb St. Paul Dist.		713-G1-F5-060	G-225 BATCH FORTRAN II	X		The program obtains an optimum section of a T-Type flood wall as required for overturning stability and determines the base pressure moments and shears for use in designing the wall component.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
DESIGN OF CHANNEL T-WALL	C. Stephenson Los Angeles Dist.		713-X6-L1-002	GE-437 CDC 7600	X		To design a reinforced concrete channel T-Wall section. Program computes required base length. Channel overturning, sliding, and toe and heel pressures. Designs thickness for toe, heel, and stern and calculates the required area of steel for the governing load condition.
INVERTED T-FLOOD WALL STABILITY DESIGN	R. Veselka R. R. Petter Galveston Dist. W. A. Price WES	ECPL	713-G1-M3-060	G-225 BATCH FORTRAN	X		Inverted T floodwall design/analysis, in accordance with EM 1110-2-2501. Varies base width for minimum width for compliance with input criteria for stability, earth bearing pressure, creep ratio and stem ratio. Sloping base, key at heel. Wave force, earth slope, and surcharge input.
	Galveston Dist. (See also W. A. Price at WES)	ECPL	713-G1-M3-060B	G-225	X		Supplement B to program 713-G1-M3-060 (Inverted T Floodwall). Prepares special data cards to force the main program to determine minimum base width for a retaining wall with ground water table below the finished grade elevation over the toe.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
INVERTED T-FLOOD WALL STABILITY DESIGN (continued)	Galveston Dist. (See also W. A. Price at WES)	ECPL	713-G1-M3-060A	G-225 BATCH FORTRAN	X		Supplement A to program 713-G1-M3-060 (Inverted T Floodwall) calculates excavation width, concrete and earthwork quantities, and estimated cost of walls designed or analyzed by main program. Post-processor, linked by cards punched by main program plus added existing earth and cost data cards.
DESIGN OF CHANNEL L-WALL	C. Stephenson Los Angeles Dist.		713-X6-L1-004	GE-437 CDC-7600	X		To design a reinforced concrete channel section for the case where half the width of channel is equal to or greater than the height of the wall. The program results in computation of moments at 1-foot intervals with area of steel and K-values for the corresponding moments for the channel empty, full or any intermediate water depth.
L-WALL	Hradilek and Lizardi Computer Science R. J. Pensak Los Angeles Dist.		Computer Sciences Corp. Terminal (INFONET)	FORTRAN IV for UNIVAC 1108 Computer	X		Design of channel "L" Wall under combinations of soil and water loads and live load surcharge.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
STABILITY ANALYSIS OF NAVIGATION LOCK WALL (L-WALL)	William Galyean Huntington Dist.	WESLIB	713-F3-H1-014	HONEYWELL G-635 TSS FORTRAN	X		Selects the base width heel and toe dimensions of lock walls for foundation pressure, stability, and sliding criteria. Will consider up to 10 loading conditions and permit reverse rotation between the various loading conditions.
CANTILEVER RETAINING WALL STABILITY (S) CASE	Leonard Manson New Orleans Dist.		713-F3-A2-120	G-600 TSS FORTRAN IV	X		Program has been replaced by A & S version Program No. 741-F3-A2-370.
CANTILEVER RETAINING WALL	J. D. Rafferty San Francisco Dist.	ECPL	713-G2-L3-003	GE-400 BATCH FORTRAN	X		This program investigates a given section or determines the dimensions and designs the reinforcing steel for a cantilever retaining wall.
BOUSSINESQ SURCHARGE PRESSURES ON RETAINING	Joseph Davis Jon Eckles Gerald Schwalbe St. Louis Dist.		713-R1-A3-690	G-635 BATCH FORTRAN	X		This program was written to provide the incremental and resultant pressures and moments arms active stem and heel.
K C RETAINING WALL DESIGN	Marion Harter Byron Bircher Kansas City Dist.		713-F5-C1-030	HONEYWELL G-437 BATCH FORTRAN	X		Design of cantilever and gravity walls.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
RETAINING WALL DESIGN	J. W. Bowles Bradley Univ. D. J. Cook Detroit Dist.		741-C1-F3-009	G-225 BATCH FORTRAN II	X		The program designs a retaining wall based on a cantilever design using Working Stress Design (WSD). The cantilever is reinforced concrete with the wall elements (stem, toe, heel and key) sized to meet general stability and structural design criteria.
RETAINING WALL DESIGN	General Electric Dani Ragsdale WES		CD225-P2.012	GE-400/600 BATCH FORTRAN	X		Accomplishes one of three (3) separate functions. (1). Design of a cantilever retaining wall. (2). Analyzes a given cantilever wall. (3). Produces an analysis of a gravity retaining wall.
RETAINING WALL DESIGN2	General Electric Pittsburgh Dist.		713-F7-H4-170 (713-24-170	G-225 BATCH FORTRAN	X		Design reinforcement for retaining walls.
FLOODWALL STABILITY ANALYSIS	Harold Fowlkes Kansas City Dist.		713-F5-C1-170	G-225 Remote to G-437 BATCH FORTRAN	X		Stability analysis for design of inverted T-Walls.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
FLOODWALL STRUCTURAL AND SLIDING STABILITY	C. Powers Metka Louisville Dist.		741-G1-H2-010 (741-22-010)	G-225 BATCH FORTRAN	X		Makes structural (overturning) and sliding stability (by creep method) analysis of flood-walls.
EFFRAM	Paul R. Lalibert William Holtham New England Div.		713-F7-D0-110	GE-400 BATCH FORTRAN IV	X		Computes joint deflections and member end forces which are subjected to joint displacements. The structure may be found on an elastic foundation.
WALL STABILITY ANALYSIS AND PLOT	Frank Webster George Henson Tulsa Dist.		713-G1-M5-300	G-225 BATCH	X		The program computes a stability analysis of a retaining wall and makes a plot of the retaining wall stability analysis complete with wall section, load and force diagrams, resistance to sliding values, and notes, for use as a design memorandum plate.

** Also available from St. Paul District (713-G1-F5-060).

15. FRAMES AND TRUSSES

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
MULTIPLE LOAD CASE PLANAR ORTHOGONAL FRAME ANALYSIS (OFRAME)	Robert Brittian Memphis Dist.		713-G9-A1-030	GE-430 TSS FORTRAN	X		Determines the joint displacement and rotations, member end moments, and shears, and structural reactions for planar orthogonal frames.
GFRAME (X0006 in CORPS)	Robert Brittian Memphis Dist. W. A. Price WES	CORPS WESLIB ECPL	713-F5-A1-040	HONEYWELL G-437 BATCH WES G-635 TSS	X		The program determines the joint displacements and rotations, member end moments shears and axial loads and structural reactions for planar rigid structures.
2-D NON-ORTHOGONAL PLANE FRAME ANALYSIS	Charles Hargett Vicksburg Dist.		713-F3-A4-140	G-437 BATCH FORTRAN	X		This program is designed to analyze plane frames or continuous beams taking into account bending and axial deformation. The structural system may be orthogonal, non-orthogonal or a combination of both. Analysis is by stiffness method.
PLANE FRAME MATRIX ANALYSIS	Morris Ganaden Bryon Bircher Kansas City Dist.		713-F5-C1-190	HONEYWELL G-437 BATCH FORTRAN	X		Two dimension structural frame analysis using Matrix methods.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
2-D FRAME	Wilson Univ. of CA./ Walt Diely Omaha Dist.		713-M1-C2-200	HONEYWELL G-437 BATCH FORTRAN	X		Joint deflection, member end forces, and joint reactions are determined for plane frames which may be subjected to joint loads.
2-D FRAME COMBINED LOAD CASES	Wilson Univ. of CA./ Walt Diely Omaha Dist.		713-M1-C2-20A	HONEYWELL G-437 BATCH FORTRAN	X		Same as above but modified so that the results of runs for individual load cases can be combined in any desired ratio.
VANDERBILT FRAME	Vanderbilt Univ. Walt Diely Omaha Dist.		713-M1-C2-400	G-437 BATCH FORTRAN	X		Used to solve for shear, moment, deflection, and rotation at the joints of plane frames.
EFFRAM	Paul Laliberte William Holtham New England Div.		713-F7-D0-110	GE-400 BATCH FORTRAN IV	X		Computes joint deflections and member end forces which are subjected to joint displacements. The structure may be found on an elastic foundation.
FINITE ELEMENT EQUILIBRIUM MODEL PLANE STRESS PLANE STRAIN	G. W. Ploudre J. W. Dahlen Seattle Dist.		713-K5-G3-480	IBM 360/50 BATCH FORTRAN	X		Offers an accurate solution to the plane problem without any restrictions as to the shape of the plate.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
ANALYSIS OF 2-D FRAME STRUCTURES (Similar to X0020 in CORPS)	Doherty & Wilson Univ. of CA Revised by: Anderson Walla Walla Dist.		713-K5-G4-110	IBM 360/50 BATCH FORTRAN IV	X		Joint deflections, member end forces and joint reactions are determined for plane frames which may be subjected to joint loads, joint displacements and member loads.
ORTHOGONAL FRAME	Dr. W. Brain Vanderbilt Univ. Jack Hoffmeister Nashville Dist.		713-F3-H3-010 (713-H3-010)	FORTRAN		X	Finds reactions, moment shears, deflection, of a plane orthogonal frame.
T FRAME	Robert Brittain Memphis Dist.		713-F5-H1-051 (713-H1-051)	GE-440 FORTRAN	X		Version of G Frame, displays envelope of shear & moment values for several load cases, on a storage tube graphics terminal.
ANALYSIS OF PLANE FRAMES BY DIRECT STIFFNESS (FRAME) (X0003 in CORPS)	William Ashton Rock Island Dist.	CORPS WESLIB	713-F3-F4-01C	HONEYWELL G-635 TSS & BATCH HONEYWELL G-437 TSS & BATCH INFONET UNIVAC 1108 TSS FORTRAN	X		Analysis of frames by direct stiffness method. Computer program to analyze frames of variable cross section subjected to arbitrary loading. It uses the principle of matrix structure analysis, using the displacement method. Data can be entered interactively or from a data file.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
A COMPUTER PROGRAM FOR LOCK CULVERT FRAME ANALYSIS (CULVERT)	Paul Senter Fred Tracy WES	WESLIB	713-F3-R0-017	G-635 TSS BATCH FORTRAN	X		This program was developed to calculate the shears and moments at the joints of the frame encompassing the side culvert in a lock wall. Some of the features of the program are: (1) the lock culvert is composed of four members, (2) the frame is subjected to four types.
LOCK CULVERT FRAME ANALYSIS WITH INTERACTIVE GRAPHICS (GCULVERT)	Robert Hall WES	WESLIB	713-F3-R0-A17	G-635 TSS FORTRAN	X		This program allows the user to define, display, and edit the data necessary to define a lock's wall geometry and loads. The program will analyze a frame around the lock culvert and display the moment and shears.
ANALYSIS OF 2-D FRAME STRUCTURES (X0020 in CORPS)	W. P. Doherty E. L. Wilson Univ. of CA. Revised by: J. D. Rafferty San Francisco Dist.	CORPS WESLIB ECPL	713-G2-L3-002	IBM 360 G-415 G-635 WES TSS	X		This program provides an analysis of general two-dimensional frame problems.
T FRAME PLOT	William Martin Huntington Dist.		713-G1-H1-13P (713-21-13P)	G-225 BATCH FORTRAN	X		Plot of moment and shear diagrams for TFRAME.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
FRAME ANALYSIS	C. J. Grande David McDonald Virginia Williams Mobile Dist.		None	UNIVAC 1108 BATCH FORTRAN IV		X	Analyzes frames, furnishing shears, moments, and deflections. Modified version of GENSAP developed for the Huntsville Division.
CONCRETE BOX CULVERT FRAME ANALYSIS AND DESIGN*	Jack L. Miller Albuquerque, N. M. William Galyean Huntington Dist.		713-F3-H1-111	G-400 BATCH FORTRAN	X		This program provides a rapid analysis and design of simple frame reinforced concrete structures, inclosing concrete conduits or culverts under high fills and a variety of other structures with pinned or fixed ends.
INDETERMINATE FRAME ANALYSIS (CONCRETE BOX CULVERT AND DESIGN) †	Jack L. Miller Albuquerque Dist.		713-G1-M1-070	IBM 1620 BATCH HONEYWELL G-222 G-437 BATCH G-635 TSS FORTRAN	X		The program provides a rapid analysis and design of simple frame reinforced concrete structures, inclosing concrete conduits or culverts under high fills and a variety of other structures with pinned or fixed ends.
PTRUSS (Program in Progress) † (X0007 in CORPS)	Robert Brittian Memphis Dist.	CORPS WESLIB	713-G9-A1-050	G-635 TSS HONEYWELL FORTRAN	X		Solution of joint displacements and member axial loads for planar pinned trusses.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
ANALYSIS OF PIN JOINTED TRUSSES BY DIRECT STIFFNESS (TRUSS) (X0002 in CORPS)	William Ashton Rock Island Dist.	CORPS WESLIB	713-F3-F4-01B	HONEYWELL G-635 TSS & BATCH HONEYWELL G-437 TSS & BATCH INFONET UNIVAC 1108 TSS FORTRAN	X		Plane pin jointed truss analysis by direct stiffness. Total truss structure stiffness is assembled from individual truss bar stiffness matrices. Then equation and term related to known boundary conditions are modified. Data can be entered interactively or from a data file.
DETERMINATE TRUSS ANALYSIS	David Heindel Norfolk Dist.	ECPL	713-F7-E4-580	G-225 BATCH FORTRAN II	X		Determine truss analysis of a simple statically determinate pin connected truss for the support reactions and axial stress in up to 425 members. Loads applied at joints.
TRUSS ANALYSIS	C. J. Grande D. F. McDonald Virginia Williams Mobile Dist.		713-S8-K5-301	UNIVAC 1108 BATCH FORTRAN	* X		Structurally analyzes a joint-loaded truss, furnishing: a) axial member forces b) axial member stresses c) joint displacements (allows determination of changes in member lengths), d) joint rotations.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER--OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
PCA-BM	Sefton Lucas Memphis Dist.		None	HONEYWELL G-635 TSS FORTRAN		X	Post processor for GFRAME. It computes the resisting moment for a concrete beam. Checks shear at face of support. Computes moment at fixed increments and designs reinforcement for axial load plus bending.
SM 468	Robert Fleming Vicksburg Dist.		713-G9-A4-020	G-435 FORTRAN	X		Plane Frame-Beam element finite element code.
FINITE ELEMENT METHOD IN STRUCTURAL ANALYSIS	Univ. of MO at Ralla Walt Diely Omaha Dist.		713-M1-C2-420	G-437 FORTRAN BATCH	X		Program purpose is to determine deformation and stress within 2-D plane stress structures or arbitrary shapes. The effects of displacement boundary conditions uniform loads, concentrated loads, and gravity forces are included.
AXISYMMETRIC SOLIDS	Univ of CA Walt Diely Omaha Dist. E. L. Wilson		713-M1-C2-430	G-437 FORTRAN BATCH	X		Determines deformations and stress within axisymmetric structures of arbitrary shape.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
PLANE STRESS - FINITE ELEMENT ANALYSIS	E. L. Wilson Univ of CA		713-F5-F0-002	HONEYWELL G-425 BATCH FORTRAN	X		This program determines the stress distribution, and deflections of a two dimensional continuous body subjected to both external and body forces.
CONCRETE GENERAL FLEXURE ANALYSIS (CGFA) †† (X0008 in CORPS)	E. Gates, SWGAD H. L. Miller, NPS Revised by: G. W. Ploudre Seattle Dist. W. A. Price, WES	CORPS WESLIB ECPL	713-K5-G3-010	IBM 360/50 BATCH FORTRAN IV WES G-635 TSS	X		Elastic analysis of combined axial load plus biaxial bending due to the axial load on a cracked section.
FINITE ELEMENT METHOD STRESS ANALYSIS	N. Ray Claugh Dr. Edward Wilson Univ of CA Marvin Brammer Walla Walla Dist.		713-K5-G4-710	IBM 360/50 BATCH	X		Finite element techniques to determine internal displacements and stresses in 2-D plane stress or plane strain problems.
FINITE ELEMENT ANALYSIS OF STIFFENED	Ian G. Buckle Univ. of CA James Krussel Walla Walla Dist.		713-K5-G4-720	IBM 360/50 BATCH FORTRAN IV	X		The program makes an analysis of highway girder bridge decks of arbitrary geometry.
SOLIDSAP (Special Features are Included in "SAP IV")	Dr. E. L. Wilson Univ of CA James Krussel Walla Walla Dist.		713-K5-G4-790	IBM 360/50 BATCH FORTRAN	X		This program performs static, linear, elastic analysis of 3-D structural systems.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
POSMO	W. A. Price Galveston Dist. WES		713-G1-M3-180	HONEYWELL G-225 BATCH G-437 BATCH FORTRAN	X		Links from program GFRAME (713-G1-A1-040) and calculates V, M, F axial at 1/10 points of each member for each load case. FTS 542-3645 for information.
SP STRESS	Massachusetts Institute of Technology Little Rock Dist.		16	CDC 6000 FORTRAN	X		Uses stiffness method for solving 2- or 3-dimensional elastic statically loaded structures using pinned or rigid joints.
STRESS	Massachusetts Institute of Technology Radhakrishnan WES			HONEYWELL G-600 BATCH FORTRAN	X		Structural Engineering System Solver. Performs linear analysis of elastic statically loaded framed structures.
STRUPUT	Robert Hall WES	WESLIB	713-F3-R0-023	HONEYWELL G-635 TSS FORTRAN	X		Interactive Graphics: This program allows the user to build and/or display a planar rigid frame's geometry and loading cases before the analysis. After the analysis, the user can obtain moment and shear diagrams plus a plot of the deformed shape in addition to tables of moment, shear joint displacement, and reactions.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
FESS 41 †	Radhakrishnan WES W. E. Galyean	WESLIB ECPL	741-S8-H1-274 (741-61-274)	UNIVAC 1108 FORTRAN	X		Finite Element Method of Analysis-Soil System.
MOMENT DISTRI-BUTION MULTI-STORY FRAME	Walt Diely Omaha Dist. Paul E. Boldan		713-M1-C2-050	G-437 BATCH FORTRAN	X		Computes moments & shears at the joints of all members, moments and shear distribution.

* Also available from the Albuquerque District (713-G1-M1-070).
† Also available from the Huntington District (713-F5-H1-441).
†† Also available from the North Atlantic Division (713-F3-E0-010).

16. BEAMS, COLUMNS, PLATES, BEAM-COLUMNS

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
ANALYSIS OF BEAMS BY DIRECT STIFFNESS (BEAM 1) (X0001 in CORPS)	William Ashton Rock Island Dist.	CORPS WESLIB	713-F3-F4-01A	HONEYWELL G-635 TSS & BATCH HONEYWELL G-437 TSS & BATCH INFONET UNIVAC 1108 TSS FORTRAN	X		Analysis of beams by direct stiffness method. A computer program to analyze beams of variable cross section subjected to arbitrary loading. It uses the principle of matrix structure analysis, using the displacement method. Data can be entered interactively or from a data file.
BEAMHBW (X0016 in CORPS)	H. B. Wilson Univ. of AL.	CORPS WESLIB	713-F3-R0-025	G-635 BATCH	X		General purpose continuous beam analysis. Multiple span, variable section properties, point and trapezoidal loads. Plots shear moment, slope, and deflection on terminal printer.
BEAM (SHEAR, MOMENT, DEFLECTION) (BEAMNOD) (X0015 in CORPS)	Dennis J. Beer New Orleans Dist.	CORPS WESLIB	713-F5-A2-580	GE-400 G-635 TSS		X	The program will select from a file and/or analyze a symmetrical straight member for any statically determinant one-dimensional load system which consists of transverse loads and/or couples. Companion program to I0007 in CORPS.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
DESIGN OF SIMPLE SPAN COMPOSITE BEAM (QUARTER POINTS)	C. Stephenson Los Angeles Dist.		713-X1-L1-017	GE-225 BATCH FORTRAN	X		Select and design the most economical girder section for simple-span composite bridge design. Given a particular span length, the most economical girder section may be chosen by comparing individual girder weights for various web depths, stringer spacing, or slab thickness.
COMPOSITE I-BEAM DESIGN	Larry Colbert North Carolina Division of Hwys. Larry Mitchel Wilmington Dist.		713-K8-K7-060 (713-060)	COBOL IBM 370/ 165	X		Designs one or more rolled steel I-Beams, with or without cover plates, suitable for a given span, slab, beam spacing and live load.
PROPERTIES OF BEAMS WITH VARYING DEPTH USING METHOD OF COLUMN ANALOGY	William Ashton Rock Island Dist.		713-F7-F4-73A	G-437 TSS & BATCH G-635 TSS & BATCH FORTRAN	X		
CONTINUOUS BEAM ANALYSIS FOR HIGHWAY BRIDGES	Version of WI State Prog./ Edward G. Melka Louisville Dist.		713-F3-H2-04P (713-H2-04P)	Infonet TSS UNIVAC 1108 FORTRAN	X		Computes beam characteristics dead load moments, shears, live load moments, shears reaction based on AASHTO specifications and design coverplates for web section.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
ANALYSIS OF CONTINUOUS BEAMS FOR HIGHWAY BRIDGES	Jose Nieves - Olmo Rev. by: Glenn Sikes, Georgia State Highway Dept. Seattle Dist.		713-K5-G3-020	IBM 360/50 BATCH FORTRAN IV	X		This program analyzes from two to eight spans, in any material, using the 1971 AASHTO.
BEAM ANALYSIS - COMBINED BENDING	Elex Alter Chicago Dist.		713-C8-F1-040	CDC 6400 BATCH FORTRAN IV	X		Analysis of a concrete beam to determine and/ or compressive reinforcement required. It also computes all stresses in the beam together with the allowable based on EM 1110-1-2101.
BEAM DEFLECTION	Dennis J. Beer New Orleans Dist. D. J. Elquezabal New Orleans Dist.		713-F5-A2-270	GE-435 TSS G-635		X	To calculate deflection on a beam loaded with one or more loading conditions. Program is set up to calculate the deflections caused by six different types of loading.
COMPOSITE BEAM ANALYSIS	Radhakrishnan WES	WESLIB	CD600P2.007	G-600 TSS	X		Program to Compute Beam Moments and Deflections. This program computes moments and deflections in a singlespan variable depth beam carrying concentrated and distributed loads. The end deflections are zero. The remaining conditions can involve zero slope or zero moment.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER--OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
THE ANALYSIS OF CONTINUOUS BEAMS FOR HIGHWAY BRIDGES IV	Glenn Sikes State of GA. Highway Dept. #2 Capitol Sq. Atlanta, GA. 30334 636-5280 William Morris Kansas City Dist.			IBM 360/50 CDC 7600 BATCH FORTRAN IV	X		This program performs the complete analysis of a continuous beam for a highway bridge and reports the moments, shears, and stresses, reaction, reflections, and shear connector spacings produced by the dead loads and standard highway live loads.
BRIDGE ANALYSIS PACKAGE 1	General Elec. Co./ Dani Ragsdale, WES			G-635	X		Computer ordinates and stress on continuous beams.
BRIDGE ANALYSIS PACKAGE 2	General Elec. Co./ Dani Ragsdale, WES			G-635	X		Non-composite or composite steel girder analysis.
BRIDGE ANALYSIS PACKAGE 3	General Elec. Co./ Dani Ragsdale, WES			G-635	X		Continuous highway girder analysis.
AISC COLUMN DESIGN (See also AISCC at WES)	American Inst. of Steel Construction		713-F5-H1-351 (713-H1-351)	GE-440 FORTRAN	X		Select columns for axial loading plus bending.
ULTIMATE STRENGTH DESIGN OF REIN-FORCED CONCRETE COLUMNS	G. W. Ploudre Seattle Dist.		713-K5-G3-300	IBM 360/50 BATCH FORTRAN IV	X		Designs conforms with the general require-moments of the ACI Building Code.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
STEEL COLUMN DESIGN	Walt Diely Omaha Dist. W. Gaube P. Boldan		713-M1-C2-100	G-437 FORTRAN TSS		X	Program makes calculations similar to those made by a column designer by hand methods except that "K" sidesway permitted is calculated by the computer.
HAMMERHEAD COLUMN ANALYSIS	J. Hoffmeister Nashville Dist.		713-G1-H3-060 (713-23-060)	G-225 BATCH FORTRAN		X	Finds moments and shears at various sections for eccentric load.
CONCRETE COLUMN ANALYSIS, BI-AXIAL	Carl Doughty Philadelphia Dist.		713-F5-E5-020	GE-435 TSS GE-437 BATCH GE-600 TSS FORTRAN IV		X	This program analyzes reinforced concrete columns subjected to an axial load and moments about each axis. The stresses at critical locations in the concrete section are computed as well as the maximum and minimum steel stresses. All computations are based on Working Stress Design (WSD) assumptions.
CONCRETE COLUMN STRESS (See also PCAUC and X0008 at WES)	J. Hoffmeister Nashville Dist.		713-F3-H3-050 (713-H3-050)	G-225 BATCH FORTRAN		X	Finds concrete and steel stresses in any round or rectangular section.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
MATLOCKS RECURSIVE SOLUTION FOR BEAM COLUMNS (A71350)	Larry Farmer, Univ. of MO. Tom Mudd St. Louis Dist.	WESLIB	713-F3-A3-500	HONEYWELL G-600/6000 FORTRAN TSS	X		The program analyses beam-column problems, and provides answers that approximate classical solutions to similar problems. Program analyze a model consisting of interacting oars and springs and the solution is consistent with the similarity of the model with the problem to be analysed.
MATLOCKS RECURSIVE SOLUTION FOR BEAM COLUMNS WITH MOVING LOADS	Larry Farmer, Univ. of MO. Rev. by Joseph Hartmann - SLD		713-F3-A3-50A	HONEYWELL G-6000/6000 BATCH FORTRAN	X		Same as program 713-F3-A3-500, except for moving loads.
GFRAME (X0006 in CORPS)	Robert Brittian Memphis Dist. W. A. Price WES	CORPS WESLIB ECPL	713-F5-A1-040	HONEYWELL G-437 BATCH G-635 WES TSS	X		The program determines the joint displacements and rotations, member end moments shears and axial loads and structural reactions for planar rigid structures.
EFFRAM	Paul Laliberte William Holtham New England Div.		713-F7-D0-110	GE-400 BATCH FORTRAN IV	X		Computes joint deflections and member end forces which are subjected to joint displacements. The structure may be found on an elastic foundation.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
ANALYSIS OF PLANE FRAMES BY DIRECT STIFFNESS (FRAME) (X0003 in CORPS)	William Ashton Rock Island Dist.	CORPS WESLIB	713-F3-F4-01C	HONEYWELL G-635 TSS & BATCH HONEYWELL G-437 TSS & BATCH INFONET UNIVAC 1108 TSS FORTRAN	X		Analysis of frames by direct stiffness method. Computer program to analyze frames of variable cross section subjected to arbitrary loading. It uses the principle of matrix structure analysis, using the displacement method. Data can be entered interactively or from a data file.
STRESS ANALYSIS DUE TO BENDING & COMPRESSIVE THRUST	Byron Bircher Kansas City Dist.		713-F5-C1-02A	HONEYWELL G-437 BATCH FORTRAN	X		Analysis of a beam or column subject to any combination of moment, shear, and axial load using working stress methods.
BIAXIAL BENDING	Byron Bircher Kansas City Dist.		713-F6-C1-02C	HONEYWELL G-437 BATCH FORTRAN	X		An elastic analysis of rectangular reinforced concrete members such as "hammberhead" bridge piers.
POSMO	W. A. Price Galveston Dist. WES		713-G1-M3-180	HONEYWELL G-225 G-437 BATCH FORTRAN	X		Links from program GFRAME (713-G1-A1-040) and calculates V, M, F axial at 1/10 points of each member for each load case. Call Wm. A. Price, FTS 542-3645 for information.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
SM 468	Robert Fleming Vicksburg Dist.		713-G9-A4-020	G-435 FORTRAN	X		Plane Frame - Beam element finite element code.
BENT CAP ANALYSIS	North Carolina Division of Hwys. Larry Mitchel Wilmington Dist.		713-K8-K7-080 (713-080)	IBM 370/ 165 PL/1	X		Analyzes Bridge Bent Caps as a continuous beam.
CONTINUOUS GIRDER ANALYSIS (GIRDER)	General Elec.	WESLIB	713-G1-L2-23A 713-G1-L2-23B	G-225 BATCH FORTRAN II G-635 TSS	X		Computes influence line ordinates for reactions, shears and moments in continuous beam up to 5 spans. Program "A" places unit load at ten points of each span, computes reactions, shears and moments of each support as well as moment at point of load. Program "B" use results from "A" to compute moments at every tenth point of each span.
DEAD LOAD DEFLECTION	W. E. Galyean Huntington Dist.		713-G1-H1-321 (713-21-321)	G-225 BATCH GE-400 FORTRAN	X		Computes beam deflection, due to uniform load for variable moment of inertia.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
MOMENT DISTRIBUTION	William Ashton Rock Island Dist.		713-G1-F5-020	G-225 BATCH G-600 TSS G-437 TSS FORTRAN	X		This program will distribute fixed-end moments for continuous beams without haunches and with less than 10 spans. The program will solve for both pinned and fixed-end conditions.
BMCOL	(Prof. Matlock/ Univ. of TX.) Radhakrishnan WES			G-600 TSS FORTRAN	X		Finite difference program to solve a variety of simple and complex beam-column structural problems accounting for movable loads. (UT)
BMCOL3	T. Jeffus Fort Worth Dist.		None	G-635 TSS FORTRAN IV			Analyzes continuous beams on elastic foundations.
BMCOL 4	(Prof. Matlock/ Univ. of TX.) Robert Fleming Vicksburg Dist.			GE-225 BATCH	X		Linear finite difference program to solve a variety of single and complex beam-column structure problems (UT).
SLAB30	Univ. of TX H. R. Austin WES			G-600 BATCH	X		A finite difference solutions for equations of binding for thin slabs on a Winkler foundation. Computes deflections, moments, shears, and stresses.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
PCAUC	Portland Cement Assoc. Program	WESLIB		G-635 TSS	X		"Ultimate Strength Design of Reinforced Concrete Columns."
AISCB (Program in progress)	American Inst. of Steel Const. Dani Ragsdale WES	WESLIB		G-635 TSS	X		"Computer Program for Steel Beam, Girder and Floor Framing Design."
AISCC (Program in progress)	American Inst. of Steel Const. Dani Ragsdale WES	WESLIB		G-635 TSS	X		"Computer Program for Steel Column Design."
CONTINUOUS GIRDER (GIRDER)	General Elec. Paul Senter WES James Irwin North Atlantic Division	WESLIB		HONEYWELL G-400/600 6000 BATCH G-635 TSS FORTRAN			Load Analysis Program. Girder provides an analysis of the loading (reactions, shears, bending moments) in continuous girder up to spans using least work.
MDCF	W. A. Price WESKA	WESLIB ECPL	713-F3-M3-500	600 TSS FORTRAN	X		Moment Distribution for prismatic members. Computer fixed-end moments, fixed-end shears, simple-span shears, and equivalent-FEM trapezoidal load for any superimposed combination of point loads and trapezoidal loads over any portion of the span.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
COMPOSITE PRESTRESSED GIRDER	L. A. Colbert, North Carolina Div. of Hwys. Larry Mitchel Wilmington Dist.		713-K8-K7-050 (713-050)	IBM 370/ 165-PL/1	X		Designs or analyzes a composite pretensioned prestressed concrete girder for a simple span. Girder may be AASHTO 36, 45, or 54-inch depth.
MOMENT DISTRIBUTION (See also MDCF)	Walt Diely Omaha Dist. Paul E. Boldan		713-M1-02-210	G-437 BATCH FORTRAN	X		Compute moments and shears at the reactions of a continuous beam.

17. BRIDGES

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
PSBRG	Computer Science Corporation Raymond Pensak Los Angeles Dist.		Computer Sciences Corp. Terminal (INFONET)	FORTRAN IV for UNIVAC 1108 Computer	X		Design of prestressed sections for railroad and highway bridges.
CONTINUOUS GIRDER ANALYSIS	General Elec.	WESLIB	713-G1-L2-23A 713-G1-L2-23B	G-225 BATCH FORTRAN II G-635 TSS	X		Computes influence line ordinates for reactions, shears and moments in continuous beam up to 5 spans. Program "A" places unit load at ten points of each span, computes reactions, shears and moments of each support as well as moment at point of load. Program "B" use results from "A" to compute moments at every tenth point of each span.
COMPOSITE I-BEAM DESIGN	Larry Colbert North Carolina Division of Hwys. Larry Mitchel Wilmington Dist.		713-K8-K7-060 (713-060)	COBOL IBM 370/ 165	X		Designs one or more rolled steel I-Beams, with or without cover plates, suitable for a given span, slab, beam spacing and live load.
COMPOSITE PLATE GIRDER DESIGN	Larry Colbert North Carolina Division of Hwys. Larry Mitchel Wilmington Dist.		713-K8-K7-070 (713-070)	IBM 370/ 165-PL/1	X		Designs composite of non-composite plate girders.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
BENT CAP ANALYSIS	North Carolina Division of Hwys. Larry Mitchel Wilmington Dist.		713-K8-K7-080 (713-080)	IBM 370/ 165-PL/1	X		Analyzes Bridge Bent Caps as a continuous beam.
BRIDGE LAYOUT AND ELEVATIONS	Larry Colbert North Carolina Division of Hwys. Larry Mitchel Wilmington Dist.		713-K8-K7-100 (713-100)	IBM 370/ 165-PL/1	X		Runs a variety of jobs associated with the layout and elevations of a bridge. Also used for retaining walls.
ANALYSIS OF TELESCOPIC BRIDGE PIER (AREA)	William Ashton Rock Island Dist.		713-G1-F4-37B	G-225 FORTRAN II G-437 TSS & BATCH G-635 TSS & BATCH INFONET UNIVAC 1108 FORTRAN IV	X		The computer program analyzes the stability of telescopic railroad bridge piers in accordance with AREA specifications.
CONTINUOUS BEAM ANALYSIS FOR HIGHWAY BRIDGES	W. E. Galyean Huntington Dist.		713-F5-H1-34P (713-H1-34P)	G-437 FORTRAN	X		Designs cover plates & flanges for basic web section for Highway Bridges, computes all characteristics.
GEOMETRIC SOLUTION OF HIGHWAY BRIDGES	Georgia Dept. of Highways		713-F5-H1-361 (713-H1-361)	GE-440 FORTRAN	X		Solves geometrics required in bridge design.
ANALYSIS OF CONTINUOUS BEAMS FOR HIGHWAY BRIDGES	Georgia Dept. of Highways W. E. Galyean Huntington Dist.		713-T1-H1-371 (713-91-371)	IBM 370 FORTRAN IV	X		Performs complete analysis of continuous beams for Highway Bridges.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
CONTINUOUS BEAM ANALYSIS FOR HIGHWAY BRIDGES	Version of WI State Prog. Edward Melka Louisville Dist.		713-F3-H2-04P (713-H2-04P)	Infonet TSS UNIVAC 1108 FORTRAN	X		Computes beam characteristics dead load moments, shears, live load moments, shears reaction based on AASHTO specifications and design coverplates for web section.
ANALYSIS OF CONTINUOUS BEAMS FOR HIGHWAY BRIDGES	Jose Nieves - Revised by: Gelenn Sikes, Georgia State Highway Dept. Seattle Dist.		713-K5-G3-020	IBM 360/50 BATCH FORTRAN IV	X		This program analyzes from two to eight spans, in any material, using the 1971 AASHTO.
CONTINUOUS GIRDER HIGHWAY BRIDGE ANALYSIS	William Ashton Rock Island Dist.		713-G1-F4-22B	G-225 BATCH G-437 TSS & BATCH G-635 TSS & BATCH INFONET UNIVAC 1108 FORTRAN	X		The program computes design moments for continuous highway bridge girders. Currently handles bridges with four or more parallel girders, but could be revised to handle a two girder system by modification of the lateral distribution factor.
ANALYSIS OF SIMPLE SPAN HIGHWAY BRIDGES (SIMBRG)	William Ashton Rock Island Dist.		713-F7-F4-24A	G-437 TSS BATCH INFONET	X		The program analyzes any four stringer, simple span highway bridge for AASHTO. H-truck and Lane Load. The analysis is for tenth-span points.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
ANALYSIS OF NON-COMPOSITE STEEL GIRDER (GIRD 1) (X0010 in CORPS)	Richard Atkinson William Ashton Rock Island Dist.	CORPS WESLIB	713-F7-F4-31A	G-225 BATCH G-437 TSS BATCH G-635 TSS BATCH INFONET UNIVAC 1108 FORTRAN	X		This program analyzes plate girders in accordance with the 1969 AASHTO specification.
ANALYSIS OF COMPOSITE STEEL GIRDER (GIRD 2) (X0011 in CORPS)	William Ashton Rock Island Dist.	CORPS WESLIB	713-F7-F4-31A	G-225 BATCH G-437 TSS BATCH G-635 TSS BATCH INFONET UNIVAC 1108 FORTRAN IV	X		This program analysis composite plate girders for positive moments.
ANALYSIS OF BRIDGE PIER - AASHTO	William Ashton Rock Island Dist.		713-G1-F4-36A	G-225 BATCH FORTRAN II G-437 TSS BATCH G-635 TSS BATCH FORTRAN IV	X		Stability analysis of highway bridge pier conforming to the group loading designated in the 1969 AASHTO specifications for Highway Bridges.
BIAXIAL BENDING (See also X0008 at WES)	Byron Bircher Kansas City Dist.		713-F6-G1-02C	HONEYWELL G-437 BATCH	X		An elastic analysis of rectangular reinforced concrete members such as "hammberhead" bridge piers.
PCA PRESTRESSED BRIDGE DESIGN	C. Overstreet Jesse Moore, Jr. Portland Dist. Jim Peterson Seattle		713-M1-G2-090	IBM 360/50 BATCH G-437 FORTRAN	X		Analysis and design of simple-span, precast-prestressed highway or railway bridges.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
ANALYSIS OF MOMENTS, SHEARS, AND REACTIONS FOR MOVING CONCENTRATED LOADS ON SIMPLE SPANS (WTRAIN) (X0013 in CORPS)	William Ashton Rock Island Dist.	CORPS WESLIB	713-F7-F4-21A	G-225 BATCH G-437 TSS & BATCH G-635 TSS & BATCH INFONET UNIVAC 1108 FORTRAN 11	X		The program permits immediate availability of maximum curves of moment, shears, and reactions for analyzing structures.
INFLUENCE ORDINATES AND AREAS AND DESIGN MOMENTS ON CONTINUOUS BEAMS (INFORD) (X0012 in CORPS)	William Ashton Rock Island Dist.	CORPS WESLIB	713-G1-F4-22A	G-225 BATCH G-437 TSS & BATCH G-635 TSS & BATCH INFONET UNIVAC 1108 FORTRAN	X		The program computes the ordinates required to construct influence lines for shear, moment, and reactions at the tenth span points for continuous beams. Also calculates the design moments or interior and exterior girder lines.
PCABR	Portland Cement Assoc. program William Ashton Rock Island Dist.	WESLIB		G-635 TSS BATCH INFONET UNIVAC 1108	X		"Analysis and Design of Simple-Span Precase, Prestressed Highway or Railway Bridges." Uses 1968 AASHTO or AREA specifications.
	Wm. Price, WES	WESLIB	PCABR	G-635 BATCH	X		
BRIDGE ANALYSIS PACKAGE 1	General Elec. Co./ Dani Ragsdale, WES			G-635	X		Computer ordinates and stress on continuous beams.
MULTIPLE COLUMN PIER ANALYSIS	GA. Hwy. Dept. W. E. Galyean		713-T1-H1-141 (713-91-141)	IBM 370 FORTRAN	X		Design reinforced concrete bridge piers.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
BRIDGE ANALYSIS PACKAGE 2	General Elec. Co./ Dani Ragsdale, WES			G-635	X		Non-composite or composite steel girder analysis.
BRIDGE ANALYSIS PACKAGE 3	General Elec. Co./ Dani Ragsdale, WES			G-635	X		Continuous highway girder analysis.
TWO COLUMN BENT FOR HIGHWAY BRIDGE**	F. J. Kitchens Revised by: Bob Halliburton Savannah Dist. W. C. Marak Little Rock Dist.		713-G1-M4-350	HONEYWELL G-225 BATCH FORTRAN		X	This program computes column data due to wind load, dead load and live load.
TWO COLUMN BENT HIGHWAY BRIDGE †	F. J. Kitchens Revised by: Bob Halliburton Savannah Dist.		713-G1-K6-080	G-225 BATCH FORTRAN	X		The program determines the moments, shears, and reactions necessary for the design of a two column highway bridge bent with or without a strut at the base of the columns.
COMPOSITE PRESTRESSED GIRDER	Larry Colbert North Carolina Div. of Hwys. Larry Mitchel Wilmington Dist.		713-K8-K7-050 (713-050)	IBM 370/ 165-PL/1	X		Designs or analyzes a composite pretensioned prestressed concrete girder for a simple span. Girder may be AASHTO 36, 45, or 54-inch depth.

** Also available from Savannah District (713-G1-K6-08).

† Also available from Little Rock District (713-G1-M4-350).

18. GENERAL PURPOSE DESIGN AIDS

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
PENSTOCK STEEL LINER OPTIMIZATION	Marker & DeVilbiss Alaska Dist.		713-K5-G1-100	IBM 360/50 BATCH FORTRAN IV		X	The program will determine the optimum steel type, liner thickness, quantities of steel, concrete, and excavation, and cost analysis of the same.
ANALYSIS OF NON-COMPOSITE STEEL GIRDER (GIRD 1)* (X0010 in CORPS)	Richard Atkinson William Ashton Rock Island Dist.	CORPS WESLIB	713-F7-F4-31A	G-225 BATCH G-437 TSS BATCH G-635 TSS BATCH INFONET UNIVAC 1108 FORTRAN	X		This program analyzes plate girders in accordance with the 1969 AASHTO specification.
ANALYSIS OF COMPOSITE STEEL GIRDER (GIRD 2) (X0011 in CORPS)	William Ashton Rock Island Dist.	CORPS WESLIB	713-F7-F4-31A	G-225 BATCH G-437 TSS & BATCH G-635 TSS & BATCH INFONET UNIVAC 1108 FORTRAN IV	X		This program analysis composite plate girders for positive moments.
FATIGUE STRESS INPUT DATA	W. E. Galyean Huntington Dist.		713-G1-H1-51P (713-21-51P)	G-225 BATCH FORTRAN		X	Prepares data to be used in plot programs which draws charts for allowable fatigue stresses for cyclic loading.
XSPROP	T. Jeffus Fort Worth Dist.		None	G-635 TSS FORTRAN IV			Computes geometric properties of any composite X-section.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
STABILITY OF RIGID STRUCTURES	Tim Knight Omaha Dist.		713-M1-C2-410	G-437 FORTRAN BATCH		X	Analysis of structure for sliding and overturning.
CONCRETE GENERAL FLEXURE ANALYSIS (CGFA)* (X0008 in CORPS)	E. Gates, SWGAD H. L. Miller, NPS Revised by: G. W. Ploudre Seattle Dist. W. A. Price, WES	CORPS WESLIB	713-K5-G3-010 713-F3-E0010	IBM 360/50 BATCH FORTRAN IV WES G-635 TSS	X		Elastic analysis of combined axial load plus biaxial bending due to the axial load on a cracked section. Also valid for base plates, contact bearing, and homogeneous materials.
CGFARD (X0009 on CORPS)	W. A. Price WES	WESLIB ECPL	713-F3-R0011	HONEYWELL G-600 TSS FORTRAN	X		Round Section Data Generator for Program CGFA. Generate concrete and steel coordinate data from program CGFA, Concrete General Flexure Analysis, to analyze a round cross section with optional concentric circular void and circular steel pattern.
MDCF	W. A. Price WESKA	WESLIB ECPL	713-F3-M3-500	600 TSS FORTRAN	X		Moment Distribution for prismatic members. Computer fixed-end moments, fixed-end shears, simple-span shears, and equivalent-FEM trapezoidal load for any superimposed combination of point loads and trapezoidal loads over any portion of the span.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
BIAXIAL BENDING	Byron Bircher Kansas City Dist.		713-F6-C1-02C	HONEYWELL G-437 BATCH FORTRAN	X		An elastic analysis of rectangular reinforced concrete members such as "hammerhead" bridge piers.
GENERAL CLOSURE STRUCTURE	William Ashton Rock Island Dist.		713-G1-F4-51B	HONEYWELL G-437 G-635 TSS BATCH FORTRAN	X		The program analyzes the stability of closure structures with vertical flood-gates.
SPREAD FOOTING DESIGN WORKING STRESS	F. J. Kitchens Savannah Dist.		713-G1-K6-050	GE-225 BATCH FORTRAN II		X	Determines the depth, required reinforcement size and spacing and actual bearing pressure for a footing of a given size with given loads and allowable bearing pressure.
H51	Portland Cement Association H. R. Austin WES				X		A computerized analysis for graphical solution of Westergaard equation of bending for thin slabs on a Winkler foundation (Edge Load Case). Computes block count (Pickett and Ray influence Chart No. 6) bending moment and stress at slab edge in a direction parallel to edge.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
PCA	Portland Cement Association H. R. Austin WES			G-600 TSS	X		Program solves Westergaard equation of bonding for thin slab on a Winkler foundation interion load case. Computes block count (Pickett and Ray Chart No. 4) and stress.
REINFORCED CONCRETE *PIPE DESIGN*	Harold Fowlkes Kansas City *Dist.*		713-F5-C1-100	G-225 Remote to G-437 BATCH FORTRAN	X		Computes the area of reinforcement steel in both faces. Determines steel stress and concrete stress.
BAR SCHEDULE	North Carolina Div. of Hwys. Larry Mitchel, Wilmington Dist.		713-K8-K7-110 (713-110)	IBM 360/75	X		Computes bar weights and lists the results in a format (to include in plans).
READ & STORE W SHAPE STEEL PROPERTIES	Jim Flock New Orleans Dist.		713-G2-A2-280	HONEYWELL G-415 BATCH FORTRAN IV			The purpose of the program is to read AISC steel column W shape properties and store them on tape.
GAIP (X0018 in CORPS)	W. A. Price WES	CORPS WESLIB	704-F3-R0-004	GE-635	X		*Calculates centroid*, A, I_{xx}, Y_{yy}, I_{xy}, of irregular areas bounded by arcs and lines.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
PCA AIRPORT PAVEMENT DESIGN	C. Overstreet Jesse Moore Portland Dist.		713-M1-C2-070	G-437 BATCH FORTRAN	X		Determines flexural stresses in a concrete pavement for aircraft gear loads.

* Also available from North Atlantic Division (713-F3-E0-010).

19. GEOMETRY PROGRAMS

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
GAIP (X0018 in CORPS)	W. A. Price WES	CORPS WESLIB	704-F3-R0-004	GE-635	X		Calculates centroid, A, I_{xx}, Y_{yy}, I_{xy}, of irregular areas bounded by arcs and lines.
COGO	W. A. Price WES	ECPL WESLIB	733-F3-R0001	G-635 TSS BATCH	X		General purpose coordinate geometry including structure layout. Double precision.
SECTION PROPERTIES FOR IRREGULAR SHAPES (See also X0008 at WES)	1LT Gene Unger William Wheeler Portland		713-K5-G2-210	IBM 360/50 BATCH FORTRAN IV		X	This program takes any sectional shape and calculates the area, centroid, and moment of inertia values.
CENTER (Program in Progress)	New Orleans Dist.	CORPS	733-F3-A2-240	G-635	X		Determines offset ties from a baseline to any proposed centerline which consists of simple circular curves or straight reaches.
CENTROID OF A POLYHEDRON	M. E. Pittman New Orleans Dist.		713-F3-A2-100	G-635 TSS FORTRAN		X	This program finds the centroid and volume of an arbitrary polyhedron (solid bounded by plane surfaces).

20. FINITE ELEMENT PROGRAMS

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
EFFRAM	Paul Laliberte William Holtham New England Div.		713-F7-D0-110	GE-400 BATCH FORTRAN IV	X		Computes joint deflections and member end forces which are subjected to joint displacements. The structure may be found on an elastic foundation.
SP STRESS	Massachusetts Institute of Technology Little Rock Dist.		16	CDC 6000 FORTRAN	X		Uses stiffness method for solving 2- or 3-dimensional elastic statically loaded structures using pinned or rigid joints.
FINITE ELEMENT METHOD STRESS ANALYSIS	Dr. Ray Claugh & Dr. Edward Wilson Univ of CA., Marvin Brammer Walla Walla Dist.		713-K5-G4-710	IBM 360/50 BATCH	X		Finite element techniques to determine internal displacements and stresses in 2-D plane stress or plane strain problems.
FINITE ELEMENT ANALYSIS OF STIFFENED PLATES	Ian G. Buckle Univ of CA. James Krussel Walla Walla Dist.		713-K5-G4-720	IBM 360/50 BATCH FORTRAN IV	X		The program makes an analysis of highway girder bridge decks of arbitrary geometry.

AD-A052 789 ARMY ENGINEER WATERWAYS EXPERIMENT STATION VICKSBURG MISS F/G 13/13
LIST OF COMPUTER PROGRAMS FOR COMPUTER-AIDED STRUCTURAL ENGINEE--ETC(U)
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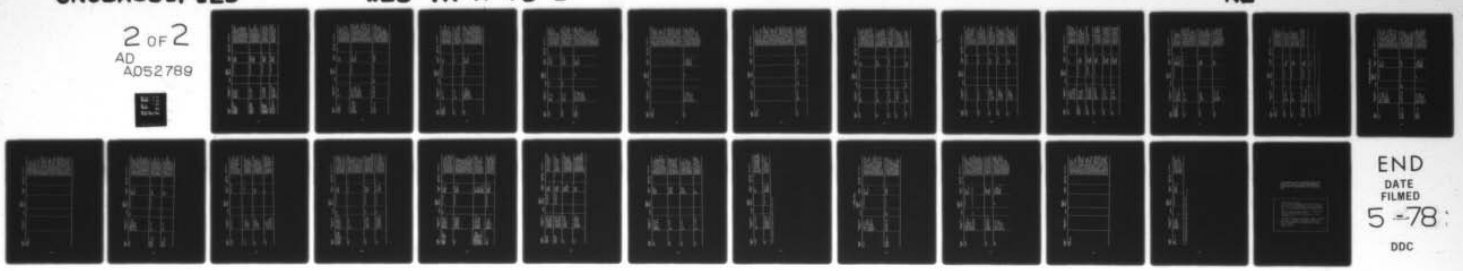

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PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
FINITE ELEMENT METHOD IN STRUCTURAL ANALYSIS	Univ of MO at Rolla Walt Diely Omaha Dist.		713-M1-C2-420	G-437 FORTRAN BATCH	X		Program purpose is to determine deformation and stress within 2-D plane stress structures or arbitrary shapes. The effects of displacement boundary conditions uniform loads, concentrated loads, and gravity forces are included.
PLANE STRESS - FINITE ELEMENT ANALYSIS	E. L. Wilson Univ of CA		713-F5-F0-002	HONEYWELL G-425 BATCH FORTRAN	X		This program determines the stress distribution, and deflections of a two dimensional continuous body subjected to both external and body forces.
FINITE ELEMENT EQUILIBRIUM MODEL PLANE STRESS PLANE STRAIN	G. W. Ploudre J. W. Dahlen Seattle Dist.		713-K5-G3-480	IBM 360/50 BATCH FORTRAN	X		Offers an accurate solution to the plane problem without any restrictions as to the shape of the plate.
SOLIDSAP (Special features are included in "SAP IV")	Dr. E. L. Wilson Univ of CA. James Krussel Walla Walla Dist.		713-K5-G4-790	IBM 360/50 BATCH FORTRAN	X		This program performs static, linear, elastic analysis of 3-D structural systems.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
SAPPILE (Included in "SAP IV")	H. W. Jones WES			G-635 BATCH	X		A modified general purpose structural analysis program (SAP4) with a three-dimensional pile element added: Good for analysis of 3-D flexible cap pile foundations.
SAP IV (See also SAP IV as enchnced and maintained by WES)	Klaus-Jurgen Bathe, E. L. Wilson, F. E. Peterson Univ of CA., Berkeley Robert Haavisto Sacramento Dist.		713-X6-L2-21A	CDC 7600 BATCH LBL FORTRAN IV	X		General finite element program for static and dynamic analysis of linear elastic structural systems. Element library includes 3-D truss, 3-D beam isoparametric 21 node 3-D solid/thick shell, isoparametric thin shell, axisymmetric solid, 3-D pipe, boundary spring. Time-history and spectral analysis capability. Currently no graphics.
SAP IV (As maintained by WES)	Ed Wilson, UC Bill Boyt, WES	WESLIB ECPL	713-F3-R0012	635 BATCH FORTRAN	X		3-D structural analysis program for linear systems. Use finite elements for static and dynamic problems with approximate mode shapes for the dynamic option. Includes SAPPILE & SAPBEAM graphics pre- and post-processing.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
SAPBEAM (Included in "SAP IV")	H. W. Jones WES		713-F3-R0-A12	G-635 BATCH	X		A modified general purpose structural analysis program (SAP4) that can automatically compute fixed end moments and shears on beam elements for in-span beam loads.
PRESAP	H. W. Jones WES			G-635 TSS	X		An interactive time-sharing program to generate data for the General Purpose Structural Analysis Program (SAP4).
GENSAP	Agbabian-Jacobsen Assoc. El Sequndo, CA. B. Haavisto Sacramento Dist.		713-X6-L2-31A	CDC 7600 BATCH LBL FORTRAN IV	X		General elastic and non-linear finite element structural analysis program. Element library includes 3-D truss, 3-D beam, plane strain, plane stress, axisymmetric solid, 3-D solid, thin plate/shell, boundary spring static and dynamic analysis, including time-history and spectral analysis. Limit graphics in pre- and post-processor.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
GPREFEM	Fred Tracy WES CAB, ADPC	WESLIB		G-635 TSS Interactive Graphics	X		An interactive graphics program for automatically generating finite element grids and on-line data editing and numberings. Pre-processor finite element program. (i.e., SAP IV)
GPOSTFEM	Fred Tracy WES CAB, ADPC	WESLIB		G-635 TSS Interactive Graphics	X		An interactive graphics program for proof-processing finite element data. Programs can generate contour plots, vector plots, isometric and perspective plots. (i.e., SAP IV)
NONSAP (As Maintained by WES)	Klaus-Jurgen Bathe, E. L. Wilson R. H. Iding Univ of CA. Berkeley K. Haavisto Sacramento Dist.		None	CDC 7600 BATCH LBL FORTRAN IV	X		Finite element program for plastic and dynamic analysis of nonlinear structural systems. Element library consists of 3-D truss, 3-8 node isoparametric axisymmetric solid, 8-21 node isoparametric 3-D solid/thick shell. Available analysis procedures are: 1) Linear Elastic; assumes small displacements, infinitesimal strain isotropic or orthotropic linear elastic material. (continued)

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
NONSAP (continued)							2) Materially Nonlinear; assumes small displacements, infinitesimal strains, nonlinear material stress-strain description. 3) Total Langrangian Formulation; element may experience large displacements and strains, stress-strain relationship is linear or nonlinear. 4) Updated Langrangian Formulation element may experience large displacements and strains, stress-strain relationship is linear or nonlinear. Program is designed for a general incremental solution of nonlinear problems, but linear analyses are possible also.
NONSAP	Klaus-Jurgen Bathe, E. L. Wilson R. H. Iding Univ of CA. Berkeley W. L. Boyt WES		None	G-635 CDC 6400 CDC 6600 EGLIN/BCS BATCH FORTRAN IV	X		Finite element program for plastic and dynamic analysis of nonlinear structural systems. Element library consists of 3-D truss, 3-8 node isoparametric axisymmetric solid, 8-21 node isoparametric 3-D solid/thick shell. Available analysis procedures are: (continued)

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
NONSAP (continued)							1) Linear Elastic; assumes small displacements, infinitesimal strain isotropic or orthotropic linear elastic material. 2) Materially Nonlinear; assumes small displacements, infinitesimal strains, nonlinear material stress-strain description. 3) Total Langrangian Formulation; element may experience large displacements and strains, stress-strain relationship is linear or nonlinear. 4) Updated Langrangian Formulation element may experience large displacements and strains, stress-strain relationship is linear or nonlinear. Program is designed for a general incremental solution of nonlinear problems, but linear analyses are possible also.
FESS41*	Radhakrishnan WES	ECPL WESLIB	713-F3-R010A	600 TSS BATCH	X		Finite element method is used to compute stresses and deformations in clay masses in plane strain geometry. Program takes into account nonlinear behavior of soil systems.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
FESS412	Radhakrishnan WES	ECPL	713-F3-R010B	G-635 BATCH	X		Stresses and deformations in soil masses in axisymmetric plane strain geometry. Soil system nonlinearity included via incremental/iterative modeling from non-linear stress strain data fitted in a hyperbolic form for both the shear modulus and Poisson's ratio.
CREEP	John O. Curtis WES			CDC 6400 BATCH		X	CREEP is a finite element code used to solve time dependent boundary value problems where increments of permanent deformation are described by a CREEP law.
AXISYM	D. M. Holloway WES	ECPL	713-F3-R0030	600 BATCH	X		Axisymmetric finite element code verified for analysis of one pile-soil interaction problem.
STATIC	J. Kirkland & R. Walker, WEL					X	Static finite element analysis of axisymmetric and planar problems using nonlinear material properties.
3-D EDIT	Fred Tracy WES	WESLIB		G-635 BATCH	X		3-D edit program for the finite element program.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
PLADANS	Jim Hill, UA			UNIVAC 1108		X	2-D dynamic plane finite element code. Uses triangular element only and uses non-linear material properties. Employs an implicit time marching scheme.
PLASANS	Jim Hill, UA			UNIVAC 1108		X	2-D static plane finite element code. Uses triangular element only and uses non-linear geometric and non-linear material properties.
ZIENK	O. Zienkiewicz Y. K. Cheung John Curtis WES			IBM 360 BATCH	X		Small FEM program from "The Finite Element Method in Engineering Science" by O. Zienkiewicz.
NOFEAR	E. Wilson, UC J. Kirkland & R. Walker, WEL-WES			600 BATCH	X		Finite element implicit time marching wave propogation code. Solves axisymmetric problems using non-linear material.
FEAR	E. Wilson, UC J. Kirkland & R. Walker, WEL-WES			G-600 BATCH	X		Finite element implicit time marching wave propogation code. Solves axisymmetric problems using nonlinear material properties.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
PLAXLY	J. Lysmer Univ of CA., Berkeley R. A. Weiss & H. R. Austin S&P Lab., WES			CDC		X	Finite element program which calculates the dynamic response of a layered elastic half-space to an applied dynamic loading.
AXISYMMETRIC SOLIDS	Univ of CA. Walt Diely Omaha Dist. E. L. Wilson		713-M1-C2-430	G-437 FORTRAN BATCH	X		Determines deformations and stress within axisymmetric structures of arbitrary shape.
FEM WILSON'S CODE†	Dr. E. L. Wilson Univ of CA. John Lambrecht Nashville Dist.		713-F5-H3-100 (713-H3-100)	HONEYWELL G-635 BATCH FORTRAN	X		Finite element Method of Analysis.
FEMWIL	Dr. Wilson (UC) Radhakrishnan WES	WESLIB	713-F3-R0-013	G-600 TSS BATCH FORTRAN	X		Finite element analysis of plane stress structures. Computes stresses and deformations. University of California.
CHEVRON	Chevron Oil Co. H. R. Austin WES			HONEYWELL G-635 BATCH FORTRAN	X		Computes closed form solution of stresses, strains and displacements of elastic multilayered soil systems.
SHELL	Shell Oil Co. H. R. Austin WES			HONEYWELL G-635 BATCH FORTRAN	X		Computes closed form solution of stresses, strains and displacements of elastic multilayered soil systems.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
ARBITRARY TWO-DIMENSIONAL STRESS STRUCTURES	Dr. E. L. Wilson Univ of CA., Berkeley William Ashton Rock Island Dist.		713-G1-F4-02A	G-437 TSS BATCH G-635 TSS UNIVAC 1108 TSS FORTRAN IV	X		Analysis of arbitrary 2-D stress structures using direct stiffness methods. Finite element program.
WAVE-L	D. K. Butler WES			CDC 7600	X		A large, multipurpose, Lagrangian, explicit, finite difference code for the solution of problems in continuum mechanics. Can be used in a deformable or rigid body mode for the analysis of projectile penetration into earth media.
CYLSHELL-1	R. Haavisto Sacramento Dist.		713-G2-L2-33A	G-437 BATCH FORTRAN		X	Program analyzes thin, cylindrical shell of constant thickness, subjected to axisymmetric loads and boundary condition. Analysis is based on material from "Theory of Plates and Shells" by S. Timeshonke.
WESTES	Radhakrishnan WES Revised by: John O. Curtis, WESSD			GE-635 BATCH	X		WESTES is a static, axisymmetric finite element code that was developed to simulate uniaxial and triaxial laboratory tests. An incrementally elastic, non-linear constitutive (continued)

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
WESTES (continued)							model called the variable moduli model is used. WESTES has also been applied to borehole pressure-meter simulations.
DUKEFOR	Duke Univ. D. M. Holloway WES	ECPL	741-F3-R0008	G-600 BATCH FORTRAN	X		1D finite element simulation of pile driving and load testing behavior.
MOMENT	Wayne Jones WES		713-F3-R0-024	G-600 BATCH FORTRAN	X		Computes moments, shears, and thrusts for a rectangular section of finite elements from the stress output of a FEM code.
FEM EDIT AND PLOT PACKAGE	Jay Creek WES William Galyean Huntington Dist.		713-F3-H1-57P (713-H1-57P)	G-635 BATCH FORTRAN	X		Finite element method edit and plot package.
TAMFOR	Duke Univ. D. M. Holloway WES	ECPL	713-F3-R0007	G-600 FORTRAN	X		

* Also available from Huntington District.
+ Also available from WES (713-F3-R0-013) and Huntington District (713-S8-H1-424).

21. EARTHQUAKE AND DYNAMIC ANALYSIS

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
SAP IV	Klaus-Jurgen Bathe, E. L. Wilson, F. E. Peterson Univ of CA., Berkeley Robert Haavisto Sacramento Dist.		713-X6-L2-21A	CDC 7600 BATCH LBL FORTRAN IV	X		General finite element program for static and dynamic analysis of linear elastic structural systems. Element library includes 3-D truss, 3-D beam isoparametric 21 node 3-D solid/thick shell, isoparametric thin shell, axisymmetric solid, 3-D pipe, boundary spring. Time-history and spectral analysis capability. Currently no graphics.
SAP IV (As maintained by WES)	Ed Wilson, UC Bill Boyt, WES	WESLIB ECPL	713-F3-R0012	635 BATCH FORTRAN	X		3-D structural analysis program for linear systems. Use finite elements for static and dynamic problems with approximate mode shapes for the dynamic option. Includes SAPPILE & SAPBEAM graphics pre- and post-processing.
NONSAP (As Maintained by WES)	Klaus-Jurgen Bathe, E. L. Wilson R. H. Iding Univ of CA. Berkeley W. L. Boyt WES		None	G-635 CDC 6400 CDC 6600 EGLIN/BCS BATCH FORTRAN IV	X		Finite element program for plastic and dynamic analysis of nonlinear structural systems. Element library consists of 3-D truss, 3-8 node isoparametric axisymmetric solid, 8-21 node (continued)

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES NO	DESCRIPTION
NONSAP (continued)						isoparametric 3-D solid/thick shell. Available analysis procedures are: 1) Linear Elastic; assumes small displacements, infinitesimal strain isotropic or orthotropic linear elastic material. 2) Materially Nonlinear; assumes small displacements, infinitesimal strains, nonlinear material stress-strain description. 3) Total Langrangian Formulation; element may experience large displacements and strains, stress-strain relationship is linear or nonlinear. 4) Updated Langrangian Formulation element may experience large displacements and strains, stress-strain relationship is linear or nonlinear. Program is designed for a general incremental solution of nonlinear problems, but linear analyses are possible also.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
GENSAP*	Agbabian-Jacobsen Assoc. El Sequndo, CA. B. Haavisto Sacramento Dist.	ECPL	713-X6-L2-31A	CDC 7600 BATCH LBL FORTRAN IV	X		General elastic and non-linear finite element structural analysis program. Element library includes 3-D truss, 3-D beam, plane strain, plane stress, axisymmetric solid, 3-D solid, thin plate/shell, boundary spring static and dynamic analysis, including time-history and spectral analysis. Limit graphics in pre- and post-processor.
SAPBEAM (Included in "SAP IV"-WES)	H. W. Jones WES		713-F3-R0-A12	G-635 BATCH	X		A modified general purpose structural analysis program (SAP4) that can automatically compute fixed end moments and shears on beam elements for in-span beam loads.
SAPPILE (Included in "SAP IV"-WES)	H. W. Jones WES			G-635 BATCH	X		A modified general purpose structural analysis program (SAP4) with a three-dimensional pile element added: Good for analysis of 3-D flexible cap pile foundations.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
PLADANS	Jim Hill, UA			UNIVAC 1108		X	2-D dynamic plane finite element code. Uses triangular element only and uses non-linear material properties. Employs an implicit time marching scheme.
NOFEAR	E. Wilson, UC J. Kirkland & R. Walker, WEL-WES			600 BATCH	X		Finite element implicit time marching wave propogation code. Solves axisymmetric problems using non-linear material.
FEAR	E. Wilson, UC J. Kirkland & R. Walker, WEL-WES			G-600 BATCH	X		Finite element implicit time marching wave propogation code. Solves axisymmetric problems using nonlinear material properties.
PLAXLY	J. Lysmer Univ of CA., Berkeley R. A. Weiss & H. R. Austin S&P Lab., WES			CDC		X	Finite element program which calculates the dynamic response of a layered elastic half-space to an applied dynamic loading.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
SHOCK ISOLATION DESIGN FOR SAFE-GUARD TSE SYSTEMS & EQUIPMENT	Space Support Div Sperry Rand Corp. Neal Davis Huntsville Div.	ECPL	713-C8-70-05S	CDC 6400 BATCH FORTRAN	X		The purpose of this system is to provide performance objectives and standard design & design verification methods for the installation of shock isolation systems.
WAVE-L	D. K. Butler WES			CDC 7600	X		A large, multipurpose, Lagrangian, explicit, finite difference code for the solution of problems in continuum mechanics. Can be used in a deformable or rigid body mode for the analysis of projectile penetration into earth media.
WAVSYN	R. M. Parsons Company, USAE Huntsville Div.	ECPL	713-C8-70-05D	CDC 6400 BATCH FORTRAN	X		"Waveform Synthesis," dynamic analysis of structures through synthesizing a time history of a motion to match any arbitrary shock response spectrum
SLAB	Agbabian Assoc. El Segundo, CA Fred Bourgeois Huntsville Div.	ECPL	713-C8-70-060	CDC 6400/ 7600 ASA BATCH FORTRAN IV	X		A system of 3 programs for large finite element modeling in the elasto-dynamic analysis of thin & moderately thick plates of arbitrary shapes.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
DYNAMIC, ELASTIC, PLANE STRAIN/ STRESS (DEPS)	Agbabian Assoc. Fred Bourgeois Neal Davis Huntsville Div.	ECPL	713-C8-70-060	CDC 6400 BATCH FORTRAN IV	X		This system offers the solution of any dynamic, plane strain, plane stress, or axisymmetrical problem that can be adequately approximated by an assemblage of 1-D FEM.
INSLAB	Agbabian Assoc. El Segundo, CA Fred Bourgeois Huntsville Div.		713-C8-70-130	CDC 6000 BATCH FORTRAN IV	†		A program for the dynamic analysis of bending and transverse shear deformations in thin & moderately thick inelastic plates. The plate can be of arbitrary shape & can have beam or column supports, concentrated masses, and interior holes at arbitrary locations.
AN IMPROVED COMPUTER PROGRAM TO CALCULATE THE AVERAGE BLAST IMPULSE LOADS ACTING ON A WALL OF A CUBICLE	Stuart Levy Picatinny Arsenal Dover, NJ Robert Wamsley Huntsville Div.			6600 CDC TSS BATCH 7000 TSS BATCH G-635 TSS BATCH G-437 TSS	X		Calculates the average blast impulse loads acting on a wall of a cubicle when an explosive charge is detonated within the cubicle.
ICES - STRUDL II	MIT Civil Engineering, North Pacific Division		802-K5-G0-800	IBM 360/50 BATCH FORTRAN IV	X		This program performs static and dynamic analysis for 2-D and 3-D structural systems. It also has member selection capabilities.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
LAND WALL STABILITY	W. E. Galyean Huntington Dist. Revised by: Barney Johnson Nashville Dist.		713-G1-H3-020 (713-23-020)	G-225 BATCH FORTRAN		X	Finds resultant forces for land lock wall, with earthquakes.
LOCK WALL STABILITY	W. E. Galyean Huntington Dist. Revised by: Barney Johnson Nashville Dist.		713-G1-H3-030 (713-23-030)	G-225 BATCH FORTRAN		X	Same as Land Walls program but with river or middle walls.
DUFE	Jesse Kirkland Robert Walker WEL-WES			G-635 BATCH CDC 7600 FORTRAN		X	Finite element explicit time-marching wave propogation code. Solves axisymmetric problems using non-linear material properties.
DUFEC	Robert Walker Jesse Kirkland/ Modified by George Baladi WES			G-600 BATCH		X	DUFEC is a dynamic axisymmetric small strain finite element computer code which utilizes an explicit integration scheme, and a plastic cap material model.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
HONDO	Samuel W. Key Sandia Lab. Revised by: John O. Curtis WES			HONEYWELL GE-635 BATCH	X		HONDO is a finite element code used to calculate the large deformation dynamic response of axisymmetric solids. Several constitutive models are available including a nonlinear elastic, non-ideally plastic cap model.
HOBCUR	D. K. Butler WES			IBM 7094 CDC 6400 BATCH TSS	X		Numerical approximations to the height of burst curves for nuclear explosions. Computes height of burst, ground range, overpressure for any yield.
PLATSL	D. K. Butler WES			IBM 7094 CDC 6400 GE-635 TSS	X		Solves the shock propagation and attenuation problem of a plate of arbitrary thickness impacting a semi-finite target by method of characteristics.
PENCO	D. C. Creighton WES			G-635 TSS		X	Analyzes normal impact penetration in homogeneous and layered targets by rigid projectiles.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
OBLIQUE	D. C. Creighton WES			G-635 TSS		X	Analyzes rigid projectile loading and rotation for oblique impact into homogeneous target up to full embedment of nose.
FEDIA	Agbabian Assoc. El Segundo, CA Neal Davis Huntsville Div.		713-C8-70-150	CDC 6400/ 7600 ASA BATCH FORTRAN IV	X		A dynamic, inelastic, 2-D, continuium finite element computer code.

* Also available from Huntsville Division (713-C8-70-06F).

22. GENERAL PURPOSE

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
SAP IV	Klaus-Jurgen Bathe, E. L. Wilson, F. E. Peterson Univ of CA., Berkeley Robert Haavisto Sacramento Dist.		713-X6-L2-21A	CDC 7600 BATCH LBL FORTRAN IV	X		General finite element program for static and dynamic analysis of linear elastic structural systems. Element library includes 3-D truss, 3-D beam isoparametric 21 node 3-D solid/thick shell, isoparametric thin shell, axisymmetric solid, 3-D pipe, boundary spring. Time-history and spectral analysis capability. Currently no graphics.
SAP IV (As maintained by WES)	Ed Wilson, UC Bill Boyt, WES	WESLIB ECPL	713-F3-R0012	635 BATCH FORTRAN	X		3-D structural analysis program for linear systems. Use finite elements for static and dynamic problems with approximate mode shapes for the dynamic option. Includes SAPPILE & SAPBEAM graphics pre- and post-processing.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
GENSAP*	Agbabian-Jacobsen Assoc. El Sequndo, CA. B. Haavisto Sacramento Dist. Fred Bourgeois Huntsville Div.	ECPL	713-X6-L2-31A 713-C8-70-06F	CDC 7600 BATCH LBL FORTRAN IV CDC 6400	X X		General elastic and nonlinear finite element structural analysis program. Element library includes 3-D truss, 3-D beam, plane strain, plane stress, axisymmetric solid, 3-D solid, thin plate/shell, boundary spring static and dynamic analysis, including time-history and spectral analysis. Limit graphics in pre- and post-processor.
STRESS	Massachusetts Institute of Tech Radhakrishnan WES			HONEYWELL G-600 BATCH FORTRAN	X		Structural Engineering System Solver. Performs linear analysis of elastic statically loaded framed structures.
NONSAP	Klaus-Jurgen Bathe, E. L. Wilson R. H. Iding *Univ of CA.* Berkeley W. L. Boyt WES		None	G-635 CDC 6400 CDC 6600 EGLIN/BCS BATCH FORTRAN IV	X		Finite element program for plastic and dynamic analysis of nonlinear structural systems. Element library consists of 3-D truss, 3-8 node isoparametric axisymmetric solid, 8-21 node isoparametric 3-D solid/thick shell. Available analysis procedures are: (continued)

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
NONSAP (continued)							1) Linear Elastic; assumes small displacements, infinitesimal strain isotropic or orthotropic linear elastic material. 2) Materially Nonlinear; assumes small displacements, infinitesimal strains, nonlinear material stress-strain description. 3) Total Langrangian Formulation; element may experience large displacements and strains, stress-strain relationship is linear or nonlinear. 4) Updated Langrangian Formulation element may experience large displacements and strains, stress-strain relationship is linear or nonlinear. Program is designed for a general incremental solution of nonlinear problems, but linear analyses are possible also.

PROGRAM NAME	AUTHOR/CONTACT OFFICE	LIBRARY	PROGRAM NUMBER-- OCE CATEGORY	COMPUTER/ MODE	DOCUMENTED YES	DOCUMENTED NO	DESCRIPTION
ICES - STRUDL II **	MIT Civil Engineering, North Pacific Division		802-K5-G0-800	IBM 360/50 BATCH FORTRAN IV	X		This program performs static and dynamic analysis for 2-D and 3-D structural systems. It also has member selection capabilities.

* Also available from Huntsville Division (713-C8-70-06F).

** See also MCAUTO"S version (Call WES User Service at FTS 542-2131).

In accordance with letter from DAEN-RDC, DAEN-ASI dated 22 July 1977, Subject: Facsimile Catalog Cards for Laboratory Technical Publications, a facsimile catalog card in Library of Congress MARC format is reproduced below.

Radhakrishnan, Narayanaswamy
List of computer programs for computer-aided structural engineering / by N. Radhakrishnan ... [et al]. Vicksburg, Miss. : U. S. Waterways Experiment Station ; Springfield, Va. : available from National Technical Information Service, 1978.
116 p. : 27 cm. (Technical report - U. S. Army Engineer Waterways Experiment Station ; K-78-1)
Prepared for Office, Chief of Engineers, U. S. Army, Washington, D. C.

1. Computer-aided design. 2. Computer programs. 3. Hydraulic structures. 4. Structural engineering. I. United States. Army. Corps of Engineers. II. Series: United States. Waterways Experiment Station, Vicksburg, Miss. Technical report ; K-78-1.
TA7.W34 no.K-78-1